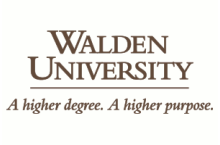

2021

A Study of Public Awareness about the Threat of Earthquakes

Mike Allen
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This is to certify that the doctoral dissertation by

Mike Allen

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2021

Abstract

A Study of Public Awareness about the Threat of Earthquakes

by

Mike Allen

MPA, Walden University, 2012

BS, Washburn University, 2005

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Administration – Policy Analysis

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February 2021

Abstract

Noticeably absent from the existing literature was a correlation study which would have gauged individual awareness for earthquakes. The literature search provided one quantifiable narrative that correlated college education with awareness about earthquakes; the study found that college graduates scored higher points on the awareness test for earthquakes than their counterparts who had no college education. The research question for this study examined the possible correlations between personal characteristics and awareness about earthquakes. A survey was developed and used to find hypothesized correlations between public awareness and a number of variables such as age, gender, education, income, and professional leadership. Public awareness for induced earthquakes by fossil-fuel operations was the focal point of this research. A sample of 143 respondents responded to an online survey. A linear regression model was fit with awareness about earthquakes as the outcome variable with the following predictors: Gender, age, college education, household income, professional leadership, marital status, political interest, camping experience, and real estate holdings. The results of the correlation test indicated one significant inverse correlation between income and participants' awareness of earthquakes. The positive social change objective of this research was to enhance public health and safety surrounding earthquakes, especially those related to man-made factors such as oil field drilling. Public awareness may assist agencies in crafting future policies from a public health and safety perspective.

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Dedication

This dissertation was dedicated to those who endured property damages from induced earthquakes by fracking operations. For those of you who want to know more about me; don’t ask about me those who envy me.

Acknowledgments

I would like to acknowledge everyone who participated in my academic accomplishments. Most of all, my committee members, Dr. Bagwell and Dr. Lee, who have provided guidance and support throughout the dissertation process; thank you for your dedication to advance the writing skills of graduates. I would also like to acknowledge some of the PhD residency faculty. Most of all Dr. Holly Rick, Dr. Ernesto Escobedo, Dr. Raj Singh, Dr. Anne Hacker, Dr. Tom Butkiewicz, Dr. Burkholder, and Dr. Emily Dahlen. Thank you all for sharing your skills with us during the residency.

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Chapter 1: Introduction to the Study

Introduction

The state of Oklahoma had experienced many earthquakes during the last decade. The high number of earthquakes that exceeded a magnitude of 2.0 on the Richter scale inspired this study. This research study was quantitative in nature and based on a theoretical framework. The impact of earthquakes on the population was addressed after collecting a sample of participants' individual characteristics and correlating them with awareness about earthquakes. Noticeably absent from the vast majority of literature was a research which correlated individual characteristics with awareness about man made earthquakes. This research was based on the analysis of such correlation possibilities.

Background of the Study

Davis (2012) focused on the politics of regulations. Corporate activities in the context of political traditions were the highlight of the article. Davis (2012) stated that newly elected governors reshaped policy decisions and made notable changes to the status quo.

Elgin & Weible (2013) highlighted the absence of methods for understanding the political contexts of public policy. This approach was a piece of a larger narrative on the outcome of rulemaking. Elgin et al. (2013) referenced the role of the Advocacy Coalition Framework (ACF) and Policy Analytical Capacity (PAC), which addressed prioritization in policymaking matters. This was comparable to the seminal work of David Easton's political system theory model (figure 4). Elgin et al. (2013) also touted the role of individuals and organizations in understanding public policy. Aside from that, Emerson,

Nabatchi & Balogh (2012) advocated several frameworks for government policy. Such frameworks were considered effective for integrating different perspectives relating to public-private relations. Emerson et al. (2012) praised the use of different frameworks that integrate differences pertaining to different cultures.

Fisk (2013) addressed the public "right-to-know" regarding the environmental backdrop of fossil-fuel projects. Fisk (2013) noted the controversial techniques of Hydraulic Fracturing [HF] that impact the population in terms of contaminating water sources. Additionally, the issue of transparency of policy was addressed as it varied from one state to another, and the rules of disclosure regarding drilling projects were not uniform at the state level. Fisk (2013) noted that a federal agency might have a uniform set of disclosure rules for the benefit of impacted populations. Other scholars stated that Shale gas operations required the injection of large volumes of treated water into rock layers to dislodge it and allow for the release of shale gas (Groat, & Grimshaw, 2012). The EPA (2013) stated that the water used for such operations was recycled and injected repeatedly into the ground.

Rinfret & Cook (2014) addressed congressional gridlock. Rinfret & Cook (2014) reported that while the Environmental Protection Agency [EPA] used a new approach to develop new rules, shuttle diplomacy helped state agencies develop policies that advance stakeholders' interest in drilling projects. Vann, Murrill, Tiemann (2014) addressed a number of legal issues regarding the amendment to the Safe Drinking Water Act [SDWA]. The SDWA was passed and became a part of the Energy Policy Act in 2005. This law authorized the EPA to regulate underground operations that endangered

drinking water resources (figure 1). The debate over regulations was noted by Vann et al. (2014) as the number of drilling wells multiplied in the last decade. Finally, Yackee (2012) addressed the role of interest groups lobbying in advance of rulemaking sessions to influence the outcome of energy-related policies. This critical move was contrary to both public safety and transparent public policy.

Figure 1. BY PHIL MCKENNA. AUG 26, 2015.
Courtesy: Faces of Fracking, via Flickr (wastewater disposal from oil and gas drilling).

Problem Statement

There is a problem with the lack of public awareness about the high number of earthquakes in Oklahoma. The number of earthquakes which registered a magnitude of 2.0 or higher on the Richter scale spiked to 1155 earthquake in 2017 (figure 2, 3). The US Geological Survey reported an earthquake analysis, which linked induced earthquakes to the number of injected barrels of wastewater into the ground; such action was a part of a process called Hydraulic Fracturing (National Earthquake Information Center, 2017). The number of earthquakes in Oklahoma dropped from the 2017 figures in the following

years as the activities of drilling abated. However, public exposure to this problem justified the use of the Emergency Planning and Community Right-to-Know Act (2017) which was passed in 1986 by the 99th US Congress, Title 42, chapter 116 USC.

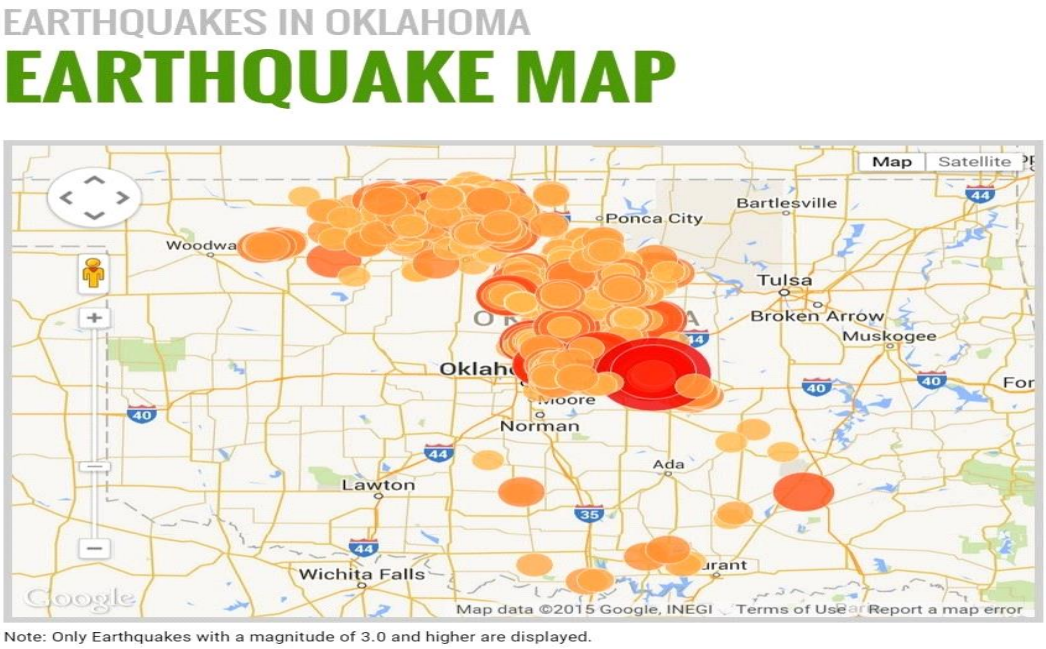


Figure 2. Courtesy: U. S. Geological Survey.

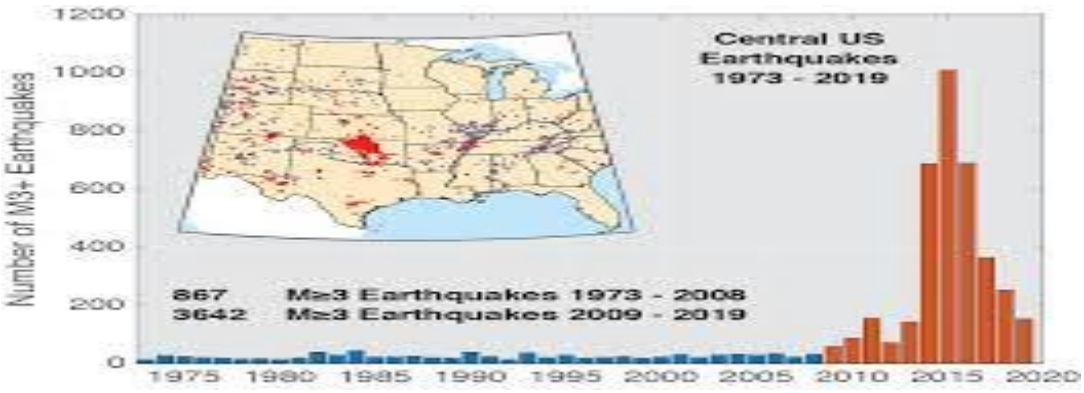


Figure 3. USGS Overview of Oklahoma earthquakes.

Purpose of Study

The purpose of this study is to correlate individual characteristics with awareness about the danger of earthquakes. Research findings will be published to elevate awareness about earthquakes. Public awareness may call for policy adjustments to ensure public health and safety.

The main objective of the study: There is little evidence of sufficient correlation-studies that address awareness of manmade earthquakes; this study is expected to fill this gap in the literature.

Research Question(s) and Hypotheses

The research question is:

What possible correlations are there between personal characteristics and awareness about earthquakes?

Hypotheses

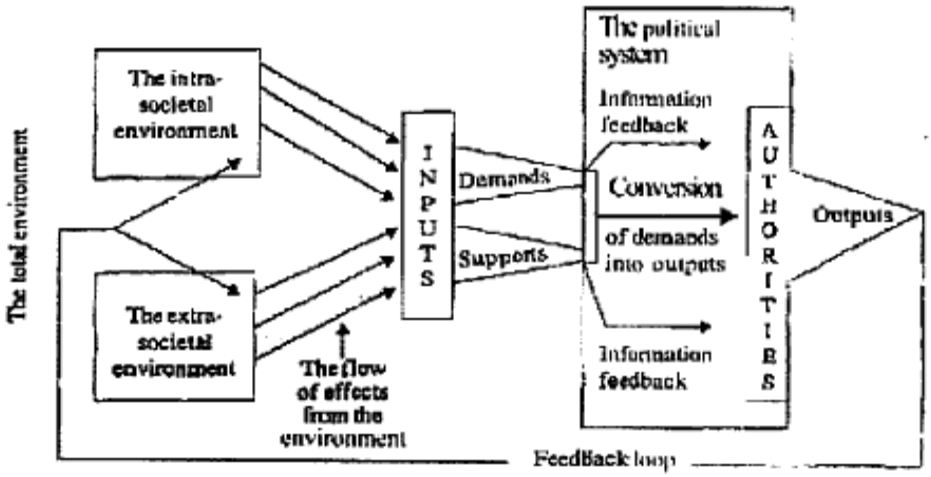
Individual characteristics such as age, gender, education, income, professional leadership, marital statue, outdoor camping experiences, political interest, and Real-Estate holdings were the independent variables [IV]. Public awareness about earthquakes was the dependent variable [DV].

H_0 (Null): $\rho = 0$ (There is no correlation relationship between the independent and the dependent variable).

H_1 (Research): $\rho \neq 0$ (There is a correlation relationship between the independent and the dependent variable).

Theoretical Foundation

The seminal literature was credited to political Scientist David Easton (1965) who developed the political system theory model. Easton's theory and model were utilized as the descriptive framework for this study; this theory was considered the main launch pad for the researcher's theoretical narrative. Easton's theory was a perfect fit to use for this study especially with regards to the environmental challenges stated by Rabe & Borick (2013) that dealt with federal oversight vs. state rules.



Source: Adapted from Easton's A Framework for Policy Analysis (1965)

Figure 4. Courtesy: Easton's Framework for Policy Analysis.

Donnelly and Hogan (2012) cited policy changes in both Ireland and Sweden, and then relayed the transformation of an entire policy in that era to the Critical Junctures Theory (figure 5). Ireland suffered in the 1950s from falling population due to the

protectionist policies that were instilled in the 1930s (Donnelly & Hogan, 2012). Elsewhere, the Swedish economy suffered in the early 1980's from upholding the status quo for many years (Donnelly & Hogan, 2012). Such examples inspired policymakers there to adopt different policies during economic crises (Donnelly & Hogan, 2012).

Critical Junctures Theory

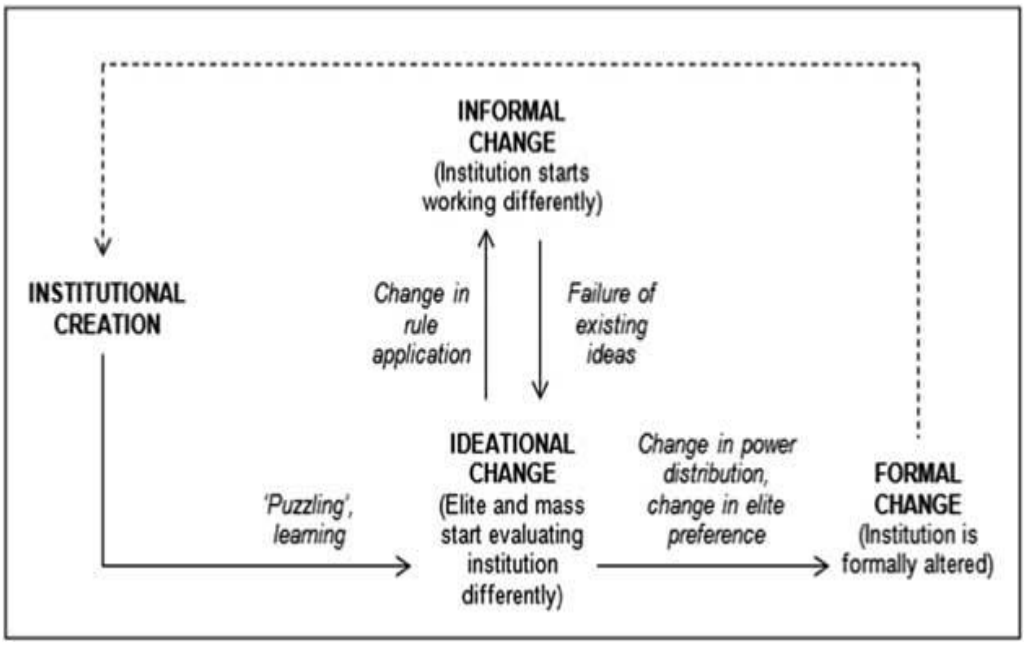


Figure 5. Courtesy: Cambridge University Press/Edward Anthony Koning.

The Critical Junctures Theory was born in response to such crises, and the outcome of it signified policy change. Comparatively, the 2017 rising numbers of earthquakes in Oklahoma posed a public safety problem that was linked to excessive well drilling. Subsequently, the use of the Critical Junctures Theory to guide its narrative of this study was justified.

Several theoretical frameworks were identified on the adoption of public policy (Sabatier & Weible, 2014). Relative to public policy, the Advocacy Coalition Framework [ACF] came about in the 1980s and presented both top-down and bottom-up views of policy changes; it was focused on the outcome of rulemaking while incorporating technology matters into policy. According to Elgin and Weible (2014), policy reflected the norms and scientific beliefs of different communities [that later were identified as coalitions]; policy also guided certain ideologies with respect to climate change. The ACF had three foundation pillars: The macro-level assumed that the behavior of policymakers was affected by prior political and socioeconomic systems, the micro-level was drawn from individual social psychology, and the meso-level called for "aggregate" accounts of many factors. Sabatier & Weible (2014) reported that the ACF examined certain policy aspects while material self-interest was debated; Sabatier & Weible (2014) also identified another theoretical framework as the Internal Determinants Framework. Such framework revealed that the causes of adopting public policy were political, economic, or social. As for theories involving the alignment of public safety issues with federal regulations, Sabatier & Weible (2014) used the Punctuated Equilibrium Theory (figure 6) to justify public policy and resolve political differences. The Punctuated Equilibrium Theory worked with the Internal Determinants Framework, and it started from hypotheses that dealt with processing disproportionate reactions to the flow of information. Sabatier & Weible (2014) noted an example of that in different policy periods of under-reaction and overreaction to the flow of information.

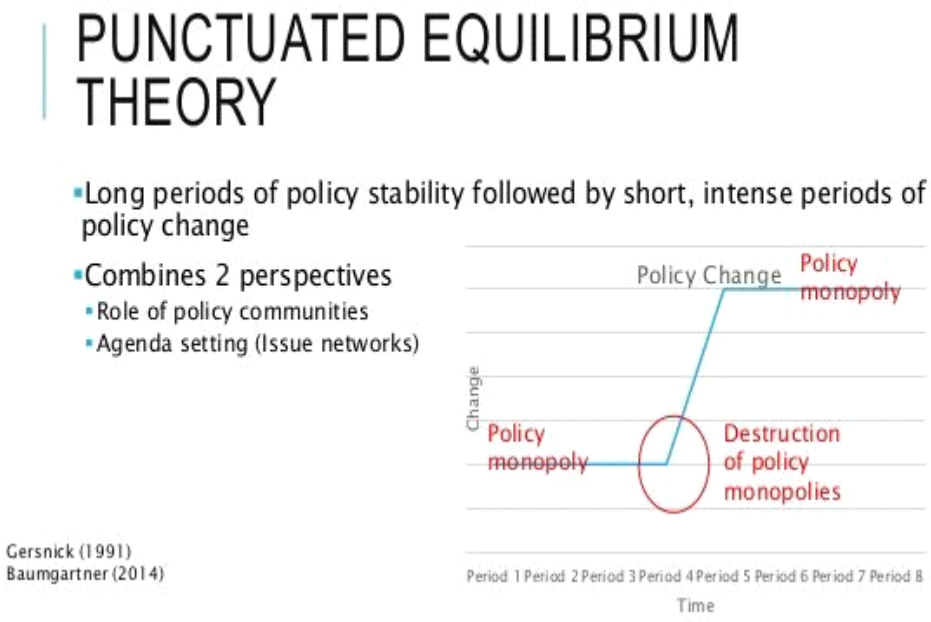


Figure 6. Courtesy: Gersnick.

The Punctuated Equilibrium Theory assumed that policy was characterized by stability, and that it leaped forward periodically regardless of the incremental characteristic that it was known for (Sabatier & Weible, 2014). As for issues regarding long lasting policies, Emerson et al. (2012) stated that long lasting policies often engaged citizen participation in the decision-making process. All of the theories and frameworks stated above justify the use of the theoretical platform in this study; the Critical Junctures Theory guided the narrative of study, and the Punctuated Equilibrium Theory was cited for its effectiveness in resolving political differences.

Nature of the Study

The nature of study is quantitative and the strength of the quantitative approach is demonstrated in its capacity to draw inferences from collected data (O' Sullivan, Rassel,

Berner, 2008). The design is Non-experimental and based on the inductive approach that could generate theory from emerging data. Proposed hypotheses were expected to reveal possible correlation-relationships between the dependent and independent variables. The dependent variable represented individual awareness, and the independent variables represented age, gender, education, income, professional leadership, marital status, outdoor camping experiences, political interest, and Real-Estate holdings. Collected data were computed by the SPSS software. The dependent variable was gauged by Likert scale instrument on a scale consisting of five scoring points to the survey question: When you recall a significant earthquake experience, how concerned do you get about the catastrophic impact of earthquakes on the population?

Table 1

Dependent Variable of the Study

Level of Awareness	Scoring points	SPSS Score	SPSS Code
Not at all concerned	1	1	xyz_1
Slightly concerned	2	2	
Somewhat concerned	3	3	
Moderately concerned	4	4	
Extremely concerned	5	5	

Note: From "Likert-type scale response anchors" by Vagias, Wade M., 2006, at Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. This scale was used with permission.

Assumptions

Awareness for earthquakes could be correlated with individual characteristics. The introduced hypotheses were used to confirm or deny such correlation possibilities. According to Frankfort-Nachmias & Nachmias (2008), correlation studies differ from causation studies in that the latter deal with spurious variables that can affect both the independent and dependent variables.

Limitations

The quantitative approach did not allow for in-depth analyses of behaviors and attitudes (Creswell, 2009). This research was focused on the quantitative method of analyzing numeral data [the results were squarely based on the analytical instruments of SurveyMonkey and the Statistical Package for Social Sciences]. Other limitations related to lack of funded research to conduct a lengthy time-series analyses of collected data were noted. Issues related to the researcher's bias towards the problem are insignificant since this research was based on the scientific method of data analysis.

Significance of the Study

The collective results of individual awareness were public awareness. Public awareness can influence policymaking, and policymaking can change the negative impact of induced earthquakes on the population. The researcher intended to signify policymaking from a public safety perspective. Collaboration between community leaders and policymakers was expected to enhance the public right-to-know certain details about fracking and earthquakes, or to amend to the Safe Drinking Water Act (SDWA) to the benefit of the public.

Significance to Theory

Both Easton's theory (1965) of Political System and Sabatier & Weible (2014) in their Punctuated Equilibrium Theory provided relevant context to the stated problem in this research. The Critical Junctures Theory was used to guide the narrative of this study. The rising numbers of earthquakes in Oklahoma with magnitude of 3.0 or greater spiked in 2015 through 2017 (figure 7); this problem justified the use of the Critical Junctures Theory in this research. A theory can only be refuted when emerging data conflict with its premise. For example, phrenology was a study that related the shape and size of the cranium to certain behaviors; this theory was refuted due to lack of external validity. Aside from that, the concept of time-decay was significant in terms of how long a theory can hold true over time.

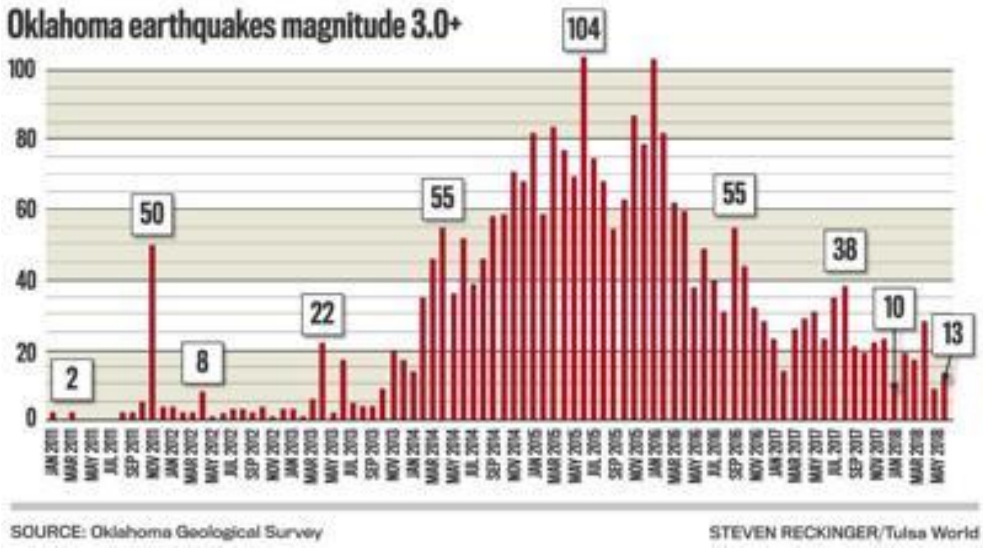


Figure 7. Oklahoma Earthquakes Magnitude (3.0+), courtesy: Oklahoma Geological Survey.

Significance to Practice

Applied social sciences often relay the research to the field of practice. Scientific analyses of data regarding a given problem could influence policymaking especially if such analyses were ethically justified. As shown in the existing literature, figure 1; pumping millions of gallons of wastewater combined with chemicals into the earth had contaminated drinking water; this practice maybe corrected in lieu of future research that supports this one.

Significance to Social Change

The object of this research is to enhance public health and safety. The number of earthquakes in Oklahoma spiked to 1,155 according to the 2017 data regarding earthquakes with magnitude of 2.0 or greater (National Earthquake Information Center, 2017). The results of this research could highlight the importance of public awareness about man-made earthquakes that can negatively impact citizens' lives. Social change can be accomplished when the research succeeds in elevating public awareness about the danger of earthquakes; social change is also realized when public policies fully account for public health and safety.

Summary and Transition

A quick review of this chapter revealed a theoretical framework as well as theories that could be used as a launch pad for theoretical research in general. Scholars provided a well thought out theoretical narrative for developing policy. Political Scientist David Easton (1965) developed the political system theory model. Easton's theory and model was utilized as the descriptive framework for this study. Donnelly and Hogan (2012) also introduced the Critical Junctures Theory which was used in recent history to

make significant policy changes due to dire circumstances. Finally, Sabatier & Weible (2014) used the Punctuated Equilibrium Theory to resolve political differences.

Chapter 2: Literature Review

Understanding Policy Change

Literature Search Strategy

The EBSCO search engine found most of the references in this study. Google Scholar found a few references. The subjects for the search criterion were:

The Politics of Lobbying

U. S. House of Representative and Environmental Regulations

Environmental Policy

Earthquakes in Oklahoma

National Earthquake Information Center

Hydraulic Fracturing in Oklahoma

The Rulemaking Process

Statistical Power Analyses

Costs and Benefits

Theoretical Foundation

The literature was mainly focused on the political context of well-drilling. Different authors who wrote about exploration drilling and induced earthquakes did not sufficiently address the issue of public awareness for earthquakes, nor did they adopt theory to solve political conflicts regarding drilling-policies. It is important to draw a distinction between the existing literature and this study which had a narrative based on Easton's Framework for Policy Analysis (1965); such narrative also justified making policy adjustments based on the premise of the Critical Junctures Theory.

Literature Review

Five major themes were identified in the literature:

Public Safety

Politics of Regulations and Policy Changes

The Role of Lobbying Groups in the Rulemaking Stage

The Outcome of Rulemaking and Diplomacy

Costs and Benefits

The US administrative procedure act regarding well drilling for fuel required state agencies to provide notice and public comment prior to rulemaking (5 U.S.C. §553 in Rinfret & Cook, 2014). The process identified three stages of administrative procedure: The first stage reflected the agency's discussion of the proposed rule (Office of Legislative Legal Services [OLLS], 2016), the second stage published a Notice of Proposed Rulemaking (OLLS, 2016); this also reflected the content of the third stage (Kerwin & Furlong, 2011). The third stage revealed a proposed rule that was approved and written for one legislative year and expiring on May 15th (OLLS, 2016). The literature indicated that lobbyists advanced the interest of their constituents and spoke anecdotally in favor of their organizations (Yackee, 2012); the literature also covered a small number of states such as Ohio or Pennsylvania that pioneered the practice of fracturing or well-drilling (Rinfret & Cook, 2014). The rulemaking in Ohio was highlighted by having the governor or state legislature shape the boundaries of debate (Rinfret & Cook, 2014), and generally it was noted that governors influenced both the debate and process by appointing special committees for such projects (Rinfret & Cook,

2014). Regulating shale gas projects [well-drilling or fossil fuel projects] had to do with the politics of the issue (Davis, 2012). Many factors such as the political traditions in the state, the method of handling risk reduction, and policymaking initiatives played a role in shaping up shale gas policies (Davis, 2012). All these factors formed a distinctive regulatory approach for every state involved in fossil-fuel projects.

Policy issues from Pennsylvania's early move into fracturing surfaced in the literature (Rabe & Borick, 2013). Shale gas operations posed a series of environmental challenges as the federal oversight was overshadowed by state rules (Rabe & Borick, 2013), and constraints on federal engagement in shale gas policies gave considerable room to the state to develop its own policy.

Pennsylvania led the revolution of fracturing by reaching the Marcellus Shale resource (Rabe & Borick, 2013). Pennsylvania was noted as a “cavalier” in advancing the methods of reaching underground resources despite the environmental risks associated with it (Rabe & Borick, 2013). It was noted that no state had a more significant role in “fossil fuel generation” than Pennsylvania.

New processes of exploration drilling presented a substantial shift from the old regulations governing shale gas operations (Groat & Grimshaw, 2012). Because HF required the withdrawals of up to 7,000,000 gallons of water for each well (Groat & Grimshaw, 2012), water quality concerns emerged, and with it came some serious environmental issues that had traditionally been assigned to the federal government. A Texas landowner filed a complaint with the EPA against the company ‘Range’ regarding their oil and gas regulator in 2010, claiming contaminated water-well due to methane gas

emission resulting from fracturing activities nearby (US House of Representatives 112th Congress, 2011). Range launched an investigation of its own operations and reported that it was not responsible for the contaminated water-well in the area, and that the contamination was not related to its operations. The EPA had authority to launch its own investigation of the complaint where 'Range' was found responsible for the water-well contamination (US House of Representatives 112th Congress, 2011). This was a rather confusing situation as the investigated entity became the investigator. The EPA's investigators duly issued an emergency order that stopped 'Range' from finishing its own investigation (US House of Representatives 112th Congress, 2011, p. 38). According to the report, the EPA also ordered 'Range' to take immediate steps to correct the problem, and to provide clean drinking water to residents in the area. As a result, the EPA was accused of producing an emergency order without proof that the gas "was a consequence of hydraulic fracturing" (US House of Representatives 112th Congress, 2011, p. 39). The EPA management issued an emergency order that followed protocol. Protocols tend to be unbiased in nature because they are drafted to cover a wide array of disputes. It may be diabolically cunning to deny evidence of gas floating in shallow earth crust without relevance to the drilling operations taking place nearby the contaminated wells. The policies governing shale gas operations have changed since the current administration took office; the signing of the executive order to dismantle federal environmental protections (Whitehouse.gov, 2017a) diminished the federal oversight over such operations.

The need for state oversight of exploration drilling operations became urgent. State laws however, tended to constrain public access to information related to fracturing. Federal law (US House of representatives, 2014) funded the federal right-to-know Act. The 99th US Congress, Title 42, Chapter 116 U.S.C. passed the right-to-know Act in 1986 in collaboration with the Emergency Response Preparedness Plan (Emergency Planning and Community Right-to-Know Act, 2017). Disclosure of information according to this law was one of the focal points of federal oversight. Absence of federal guidance from well drilling resulted in catastrophic problems one of which was the recent spike of the number of earthquakes in Oklahoma. To that end, Sabatier & Weible (2014) noted that local and state governance must lay out the rules that citizens use regarding active situations, and that such rules must be fully understood.

Public Safety

Davis (2012) addressed special interest activities in the context of political traditions. The Colorado's regulatory approach regarding fracturing was concerned with projects that have left a negative impact on the environment (OLLS, 2016). Policy enactment occurred because of legislative or executive turnover (OLLS, 2016). Newly elected governors reshaped policy decisions (Davis, 2012), and such approach made considerable changes to the status quo.

Vann, Murrill, Tiemann (2014) addressed different legal issues with respect to the amendment to the Safe Drinking Water Act [SDWA] that was passed and became a part of the Energy Policy Act in 2005. This Act authorized the EPA to regulate underground operations that endangered drinking water resources (Vann et al., 2014). Environmental

Foundations brought up the debate over regulations as underground drilling surged in recent decades (Vann et al., 2014). Environmental Foundations helped society tackle the critical challenges of this century. Provisions of Resource Conservation and Recovery Act [RCRA] exempted drillers from regulations under Subtitle C of RCRA regardless of the hazardous wastes produced in the process (Vann et al., 2014). Under the Emergency Planning and Community Right-to-Know Act [EPCRA], drillers had to comply with certain reporting requirements (Vann et al., 2014). Public safety issues also embodied the reviews of Entrekin, Evans-White, Johnson & Hagenbuch (2011). These scholars addressed the issues of renewable energy that went hand-in-hand with fracturing projects; such projects accessed gas wells by means of horizontal drilling which led to some unintended consequences (Entrekin et al., 2011). The same projects delivered mixed results in terms of public safety. Colorado for example, started its drilling projects before other states, and was considered a good example to follow as drilling policies evolved rapidly (Entrekin et al., 2011). Aside from that, the powerful overreach of agencies influenced well-drilling policies to their advantage (Davis, 2012). Fossil-fuel policies have come a long way while public awareness about such policies lagged. According to Boudet, Clarke, Bugden, Maibach, Roser-Renouf, & Leiserowitz (2014), the populace was unaware of environmental risk associated with such projects:

> To our knowledge, no academic studies have focused on how socio-demographic factors predict hydraulic fracturing support/opposition. Opinion polls however, have shown a strong gender divide, with more men in favor and more women opposed (Quinnipiac University, 2012). In addition, education has been associated with awareness of the issue. The Pew Research Center (2012) Pole found that 80% of those with college degree had heard about hydraulic fracturing versus 64% with some college (but no degree) and 51% with a high school diploma or less. (p. 9)

Data analysis of the above survey also indicated that 7% of those interviewed were aware of impacts related to contamination; and only 1% was aware of negative impacts on property and community development (Boudet et al., 2014). The general concern in this research study is that because drilling projects continued to provide considerable revenue to stakeholders, it became very difficult to scale back the negative dominant wave of such projects in Oklahoma.

Politics of Regulations and Policy Changes

Emerson, Nabatchi, and Balogh (2012) who reviewed many definitions relative to collaborative governance, have scrutinized more regulations and policy changes. According to Emerson et al. (2012), certain definitions were favored in public administration as they helped distinguish different sets of applications in governance. Definitions that allowed administrators to bring the "right people" to participate in the decision-making process were considered constructive. The participation of all parties in policy matters fostered "trust" and "mutual respect" around the bargaining table and led to collaboration among government agencies (Emerson et al., 2012). They added that broad definitions went beyond collaborative governance to reach private entities working with government agencies.

Emerson et al. (2012) also reflected their vision on future public policy. They cited different points of view and noted collaborative governance as a precursor to a positive social change. Emerson et al. (2012) concluded that new collaborative governance came down to aligning theory with practice. Elsewhere, fracturing-related oversight transferred from the federal to state level, and variations of state policies were

noted in the interim (Davis, 2012; Rabe & Borick, 2013). Colorado facilitated state law in a way that excluded landowners' right to exercise ownership of underground resources (Davis, 2012). The Colorado Oil and Gas Conservation Commission [COGCC] proposed three stages for rulemaking. The first stage promoted the interest of stakeholders, and the second developed a draft proposal accompanied by a Notice of Proposed Rule Making [NPRM]. Individuals provided testimonies while being cross-examined by other parties. Davis (2012) stated that the final stage allowed the Commission to finalize the proposed rules. However, the process of rulemaking was still supportive of corporate drillings in partnership with the state.

Exploration drilling provided an opportunity to analyze policymaking at the state level (Davis, 2012; Rabe & Borick, 2013). Drilling projects were exempted from the U.S. EPA's oversight (42 U.S.C. §15801 in Rinfret & Cook, 2014), and different states spearheaded the legislative aspect of this issue (McFeeley, 2012); this underscored the benefits won by corporations working in partnership with the state. Exploration drilling was recently on an upswing in some parts of the country, and some issues that resulted in the process were not transparent (McFeeley, 2012). The public right-to-know of the risks associated with drilling should remain in place (Emergency Planning and Community Right-to-Know Act, 2017). Additionally, McFeeley (2012) noted the following:

> A disclosure regime highlights responsible corporate actors while calling attention to practices that jeopardize the environment and public health…. Disclosure that hydraulic fracturing treatment itself should include information on the pressures used, and the volume, type, and source of the "base" fluid…. Exemptions must only be used for legitimate trade secrets, and regulators must ensure that requirements to make information public are not subverted. (pp. 4-6)

Disclosure of risks associated with exploration drilling was needed under state oversight (Vann et al., 2014). Perhaps this was the distinctive negative outcome from state versus federal oversight.

New lessons in policy making resulted from the Pennsylvania's early move into Hydraulic Fracturing (Rabe & Borick, 2013). The fact that federal oversight of HF was scaled back gave considerable latitude to the states to enact their own policies. As noted above, Pennsylvania led the HF revolution and developed the 2012 legislation regarding its operations (Rabe & Borick, 2013). State oversight over HF projects had to be revived by federal oversight in some cases. In the case of Dakota Pipeline for example, the project was halted until an Executive Order by President Trump was issued in 2017 to resume such project; this was a clear example of legislative policy that required federal oversight.

Public Policy Issues and Paradoxes

The vast majority of references were focused on the conflicted politics of energy policies (Yackee, 2012). While looking at these issues on a national scale for example, it appeared that exploration drilling was banned alongside the shores of the Atlantic and Pacific oceans during the Obama administration. President Trump however, signed an executive order in 2017 to extend offshore drilling to areas that had been closed off to big oil companies (Whitehouse.gov, 2017b). Resuming exploration drilling off shores could produce oil glut in the marketplace and halt the activity of drilling in the Midwest. It is difficult to forecast the effects of Trump’s executive order (Whitehouse.gov, 2017b) on HF projects in Oklahoma although Cushing has always been a significant part of this

industry. Relative to the subject of 'Politics of Regulations and Policy Changes'; collaborative governance is likely to suffer when political ideologies differ from one administration to another. As new politicians are voted into office every 4 years, the results may create a convoluted web of conflicted policies.

The evolution of public policy issues parallel the rulemaking process. Rinfret & Cook (2014) stated that stakeholders have influenced the rulemaking process continuously. When the federal oversight of HF activities was suspended, the result was the Halliburton crisis in 2005 (Rinfret & Cook, 2014), so the debate regarding governmental oversight over policy issues will always be alive. Federal regulations had many critics on the state level. According to the U. S. House of Representatives (2014):

> Traditionally, the federal government has relied upon voluntary grant-in-aid funding to encourage state and local governments to act to further policy in the national interest. However, in the 1970s and the 1980s, there was a shift in this relationship. The federal government increasingly relied upon compulsory programs and regulations to impose duties on state and local governments in furtherance of national goals. These intrusive initiatives, which result in un-subsidized, federally induced costs, are unfunded mandates. (p. 49)

State and federal funding of mandates can be expected to get complicated especially when they are written by government entities that direct their funding. Local governments, think-tank commentators, and commentators by the Government Accountability Office [GAO] discovered that only one in four federal mandates was appropriately funded by the federal government, and that the remaining unfunded mandates simply became financial burden on state governments (US House of Representatives, 2014). The Committee on Oversight and Government Reform in the US House of Representative (2014) provided that its function was in line with "representative

democracy", and that the federal government had powers demonstrated by the acts of Congress. During the 1990s, the EPA [federal agency] produced estimates for methane emissions that pertained to the national average of shale gas production. Such estimates increased between 46.5 and 119.7 percent each year from 1990 to 2008 (The US House of Representative, 2014). A report on the agenda of the US House of Representative (2014) revealed that the EPA's shale gas estimates were inflated to induce further regulations on shale gas producers. The report went on to say that methane figures were made-up, and that they trumped the economic growth of big oil companies during such time (The US House of Representative, 2014). It was not unusual for such estimates to increase a certain percentage on an annual basis especially since Rinfret & Cook (2014) stated that the practice of HF was spreading rapidly in the 1990s, and that the new technology accelerated gas production. Perhaps the different numbers of gas estimates made by different states were local and based on uneven distribution of pockets of resources while the EPA's report was based the on the national average.

Exploration drilling was on an upswing in recent year. While corporate actors at 'Range' decried the orders imposed on them by the EPA, Baker Hughes management announced that the US rig count rose from 404 rigs in May of 2016 to 901 in May of 2017, and that Oklahoma added 4 during that time (Baker Hughes Associated Press, 2017). In retrospect, exploration drilling spiked without any objections from the indigent population in Oklahoma. Unlike Texas, the state of Oklahoma provided a friendlier climate for corporate business; perhaps one of the helpful factors to corporate business was rooted in the history of Oklahomans. History revealed that the state of Oklahoma

was predominantly an Indian Territory before the Civil War, and following the Civil War in the late 1800s, statehood was granted to peasants who occupied the land (History of Oklahoma, 2017). This was a different picture from the situation in Texas. The six flags over Texas were indicative of a long-standing territory ruled by six European countries (History of Texas, 2017). Clear though not directly expressed, the upper middle class of Texans likely played a role in elevating the EPA's regulatory controls there. Comparatively, the indigent population in Oklahoma had no measurable resistance to corporate business. Big oil corporations thrived on the passive nature of indigent population in Oklahoma; they did business while having the support of the state in the process.

The Role of Lobbying Groups in the Rulemaking Stage

The role of interest groups in the rulemaking process was perplexing. A candid dialogue about the pros and cons of HF with interest groups seemed difficult to square with the reality of lobbying behind closed doors (Yackee, 2012). Under the current picture of rulemaking setup, lobbyists secured many benefits in the pre-proposal stage of rulemaking (Yackee, 2012). Lobbyists' activities were politically motivated, and such characteristic became accepted in the executive branch (Rinfret & Cook, 2014). According to Yackee (2012), lobbying activities supported by substantial amount of spending by big oil companies tipped the scale in favor of lobbyists. Yackee (2012) also noted that lobbyists had an unfair advantage over writing fracking policies. Scholars addressed the political overtone that influenced the decisions of governors as well as state legislature (Rinfret & Cook, 2014). Some scholars also advocated the views of

environmentalists who called for “environmental justice” and the sustainability of laws in order to protect public health and safety (Dernbach, Salkin, Brown, 2012; McFeeley, 2012). The issue of damaged buildings due to the rising number of earthquakes in Oklahoma was clearly under-reported. Other problems of methane explosions in homes or in places of contaminated well waters were more urgent. According to Groat and Grimshaw (2012):

> In addition to impacts on water quality in wells, claims have also been made about home and well house explosions caused by migration of natural gas from shale gas wells. In one well-known case in Ohio, a house exploded soon after a nearby hydraulically fractured well was drilled. After much investigation by the regulatory agency and a private geological engineering consulting firm, followed by study of the case by a distinguished review committee, it was concluded that methane may have migrated to the house along shallow horizontal fractures or bedding planes.... Other cases of methane explosions in homes and well houses have been investigated in Colorado, Pennsylvania, and Texas. (p. 28)

Many Oklahomans have suffered considerable damage to their properties. Images of destruction made available by the National Geographic Earthquake (2016) depicted the harsh reality of induced earthquakes. However, the benefits and revenue collected from HF projects slowed down the will of policymakers to come up with a meaningful policy change. Practices of environmental degradation were bound to harm humans until regulations, which call for reasonable “cultural services” eventually protect public health and safety (Dernbach et al., 2012). Because low-income populations suffered the most since they lived in areas where environmental degradation took place, the idea of environmental justice came about in 1994 when President Clinton established a program by which small grants were given to disadvantaged populations occupying such areas. A recent phone interview made by NPR News highlighted the danger of earthquakes in the

state of Oklahoma (NPR, 2015). Lawmakers passed a bill there to prevent local communities in the state of Oklahoma from banning HF in their communities. Perhaps they were influenced by lawmakers in Texas because a similar bill was passed around the same time in Texas to ban local bans on HF projects. These bills surfaced in 2015 when lawmakers in both states had political fallout with local community leaders who banned Shale gas operations. The US Geological Survey reported an earthquake analysis that linked the occurrence of earthquakes to the number of injected barrels of wastewater into the ground (National Geographic Earthquake, 2016). There was no doubt in that analysis which suggested that earthquakes were not the result of Hydraulic Fracturing. The analysis also included a headline about the companies that bumped the most fluids in disposal wells (National Geographic Earthquake, 2016). It was irresponsible for big oil companies to disown the problem that had to do with pumping massive amounts of fluids into disposal wells while conducting the HF business. Big oil companies pumped massive amounts of fluids to the tune of 4.2 billion barrels in disposal wells (National Geographic Earthquake, 2016). The object of this research is to help impacted populations by earthquakes to reason with authorities about this problem, and to rely on research rather than anecdotal arguments in the process. Scientific research has a way of making reliable deductions that helps confirm or negate specific myths. Many lawsuits were filed by impacted groups who regarded HF as culprit behind the elevated number of earthquakes in Oklahoma.

Lobbyists were responsible for reckless drilling near populated land. While exploration-drilling activities remained a substantial overhang in this country, public

concerns did not seem to make much of an effect on rulemaking to mitigate the risks associated with such activities. Scholars concur that the impetus of regulations is an obstacle for environmentalist groups (Davis & Fisk, 2015; Vann et al., 2014.). Additional attempts by President Trump to dismantle the EPA (Whitehouse.gov, 2017a) had reversed energy policies and called for reassessment of all measures from jurisdiction oversight to appropriate drilling practices. By contrast, the strategy signed in an executive order [12898] by President Clinton was considerate of impacted populations by this problem. According to Dernbach et al. (2012):

> More recently, EPA administrator Lisa Jackson has made environmental justice a priority, announcing Plan EJ 2014 (to mark the 20th anniversary of President Clinton's 1994 executive order) to further help the EPA integrate environmental justice into the agency's programs, policies, and activities. The effort is designed to result in a strategy, not a regulation, to protect health in communities overburdened by the pollution; to empower communities to take actions to improve their health and environment; and to establish partnerships among local, state, tribal, and federal organizations to achieve healthy and sustainable communities. (p. 16)

Similar strategies are still needed to protect the communities that lost the political fight. Proactive strategies were needed in battered Oklahoma communities to get community leaders to follow state law. More examples of inter-agency coordination are needed to protect public interest.

Special interest groups have donated substantial amount of monies to the Congressional and Senate Leadership Fund to influence HF projects. Devon Energy of Oklahoma donated $500,000.00 to the Congressional Leadership Fund as of August 11, 2016 according to the Federal Election Commission data released on May 16, 2017 (Center for Responsive Politics, 2016, Appendix A, table 2). Devon Energy also donated

$750,000.00 to the Senate Leadership Fund as of September 28, 2015 (Center for Responsive Politics, 2016, Appendix A, table 3).

Table 2

Congressional Leadership Fund (Center for Responsive Politics, 2016).

Donor	Name of Company	Date	Amount
Oberndorf, William, E. San Francisco, CA 94118	Oberndorf Enterprises LLC	08/10/16	$500, 000
Devon Energy Production CO LP Oklahoma City, OK 73102		08/11/16	$500, 000
Russell, Thomas, H. Tulsa, OK 74136	Retired	09/02/16	$500, 000

Table 3

Senate Leadership Fund (Center for Responsive Politics, 2016).

Donor	Name of Company	Date	Amount
Chevron		09/28/15	$1000, 000
Concord, CA 94524			
Petrodome Energy		10/09/15	$1000, 000
Houston, TX 77006			
Access Industries Inc		12/08/15	$1000, 000
New York, NY 10019			
Stephens, Warren, A.	Stephens Inc.	03/31/16	$1000, 000
Little Rock, AR 72201			
Chevron		03/17/16	$1000, 000
Concord, CA 94524			
McNair, Robert, C. SR	Houston, Texans	05/19/16	$1000, 000
Houston, TX 77054			
McNair, Robert, C.	Houston, Texans	04/30/15	$1000, 000
Houston, TX 77054			
Devon Energy Production		09/28/15	$750, 000
Oklahoma City, OK 73102			
Asness, Cliff	AQR Capital	09/23/16	$600, 000
New York, NY 10017	Management		
Stephens, Warren, A.	Stephens Inc.	08/31/16	$500, 000
Little Rock, AR 72201			

The controversy of negative politics was supported by massive donations to leadership funds. The object of public interest was overlooked as a result. Energy policies embodied some political ideologies that condoned the practices made by big oil companies; such practices disregarded environmental risks, which were the center of controversy surrounding HF projects (Clarke, Boudet, & Bugden, 2013). When the jurisdiction oversight transferred from the federal to the state level in recent years (42 U.S.C. §15801 in Rinfret & Cook, 2014), state policy differences emerged from different states (Kerwin & Furlong, 2011). The federal oversight however, was uniform in that regard. In summary, the Literature Review shows that Ohio and Pennsylvania adopted the three stages approach to rulemaking. During the first stage, a general discussion was expected to cover the proposed rule; during the second stage, different agencies developed a preliminary proposal; and during the third, the approved rules were written on the record for one legislative year, and expired May 15 (OLLS, 2016). It was not entirely clear from the Literature Review whether the state of Oklahoma followed the three-stage process of rulemaking.

The Outcome of Rulemaking and Diplomacy

Colorado had an open door to a transparent rulemaking process. Lobbyists however, continued to lobby for their constituents during the rulemaking sessions (Kerwin & Furlong, 2011). The impacted populations continued to attend stakeholders' meetings. In Colorado for example, the public attended state agency's meetings that drove the process of rulemaking (Jaffe, 2011). Attendees provided their input by

submitting their comments and concerns to change the language of the final rule (Jaffe, 2011). Considering that politics were deeply entrenched in stakeholders' meetings, and that the environmentalists were in a tug of war with special interest groups (Jaffe, 2011; Kerwin & Furlong, 2011), one could deduce that such political conflict also exists in Oklahoma. Exploration drilling regulations may prove to be complicated. However, attending all the different stages of rulemaking and providing supporting materials for consideration can be beneficial for impacted populations (Kerwin & Furlong, 2011). The processes of rulemaking are different from one state to another. Davis (2012) noted that special interests influenced the political tradition in some states, and that Colorado's regulatory approach offered more environmental protection than other states' regulatory approach.

Future research can be directed into examining different policies. It would be helpful to find out who managed the operative aspect of HF in Oklahoma. In some states, the governor had the most discretion in determining the direction and magnitude of operations (Rabe & Borick, 2013). While the legislature was responsible for the process of rulemaking (Rinfret & Cook, 2014), state agencies influenced its processes. Another object of the research was to determine if Oklahoma had a register that outlined the rulemaking process. Different states had individual registers like the federal register for recording the rules of drilling (Kerwin & Furlong, 2011). As the focus of this study was geared towards building awareness and not shaming stakeholders, the Oklahoma register regarding HF rules was not sought out. As for the scholarly perspective on the outcome of rulemaking, McFeeley (2012) highlighted the disclosure regimes as an essential part of

the scheme. No written laws however, forced the disclosure of proprietary information pertaining to trade secrets (McFeeley, 2012). McFeeley (2012) wrote:

> States provide an exemption to the disclosure requirements for information deemed to be proprietary…. Unfortunately, most states have effectively given the fracking industry a free pass to avoid disclosure requirements when a company claims trade secrets are involved. Only Wyoming and Arkansas require submission of factual justification to substantiate a claim that information should be kept confidential. Yet Arkansas has no clear process for evaluating the facts to determine whether claims are legitimate. Wyoming does have such a process. (p. 12)

The above citation offered a direct answer to the disclosure requirements for the states, which included Oklahoma. As for the logistics of disclosure regimes, McFeeley (2012) stated the following:

> Many of the substances used in the fracturing process are toxic. Some like formaldehyde are known carcinogens. There are significant risks associated with the release of dangerous substances used in fracking. Blowouts have occurred during fracking operations…. After the fracking process is complete, a portion of the fluids that were pumped into the ground flow back to the surface. This "flow back" can also contain toxic substances that are naturally occurring underground, including arsenic, barium, lead, mercury, and radioactive elements like radium. (p. 3)

The destruction of property was another consequence of induced earthquakes. Perhaps legal representation of impacted populations by earthquakes was needed.

Costs and Benefits

The cost of exploration drilling embodied another part of the literature. Christenson et al. (2017) monitored public response to Hydraulic fracturing, and then stated that public reaction was mixed on the costs and benefits of it. Aside from the psychological damage resulting from the direct impact of earthquakes on impacted populations, physical loss and damage to property can be overwhelming in some cases.

Davis (Nov. 2012) did a study on earthquake prediction and disaster preparedness; Davis aimed at creating a preemptive solution to minimize the destructive aspect of earthquakes. Davis (Nov. 2012) presented the so-called "loss functions" with characteristics which predicted the economic impact on a province hit by a cosmic disaster or a series of earthquakes. According to Davis (Nov. 2012), loss functions can predict the monetary cost for preparing an adequate response to a natural disaster as well as the cost of alternating one's lifestyle in and out of an emergency mode.

Cost of damages made by natural disasters can be enormous. Davis (Nov. 2012) included predictors of earthquakes in a given province and identified hazardous objects such as "unenforced masonry buildings". Such buildings increased the complexity of an earthquake disaster [Unenforced masonry walls were used as load-bearing walls even though they did not meet minimum reinforcement requirements]. Moltchanova, Khabarov, Obersteiner, Ehrlich, Moula (2011) focused their research on rescue efforts in terms of timely arrival of paramedic teams on a site of an earthquake. They addressed the hours immediately following the occurrence of an earthquake and suggested a quick medical and psychological assistance. Briefly, Moltchanova et al. (2011) called for an adequate managed response to catastrophic events based on a quantitative account of resources to improve system efficiency. Another survey of 515 New Yorkers revealed that their electricity, which was a product of extracted natural gas by fracturing the earth, incurred welfare loss (Popkin, Duke, Borchers, Ilvento, 2013); the survey was concerned with welfare costs and was written from a positive return perspective. With that in mind, it appeared that one benefit of HF had a double positive impact on fiscal spending.

Another study conducted in Southeast Queensland, Australia on Coal Seam Gas [CSG] projects concluded that such projects have eroded public trust in government and led to weaker economy in that region (Phelan, Jacobs, 2016). The distribution of benefits between landholders and secular coal mining companies was significant for the continuity of future projects (Phelan, Jacobs, 2016). The alignment of public safety with corporate objectives was instrumental in making meaningful and lasting policies.

Studies conducted on humans as well as wildlife near drilling operations found a slew of health issues. According to Bamberger, Oswald (2015):

> In people, the most common health impacts at the time of the interviews fell under the categories of neurological, respiratory, vascular, dermatological, and gastrointestinal problems; there were no significant changes in health over time…. In food animals, the most common health impacts at the time of the interviews fell under the categories of reproductive, neurological, gastrointestinal, decrease in milk production, respiratory, and growth problems; significant changes in numbers of reported symptoms were noted over time in the categories of reproductions (decrease), respiratory (increase) and growth (increase) problems. (p. 552)

These findings may be different in other demographics because the external validity was not addressed properly in the above cited study. Additionally, Oswald (2015) made clear that measurements of contaminated agents were "problematic."

Summary and Conclusions of Existing Literature

The literature was concerned with political ideologies. However, some scholars provided a well thought out narrative for writing policy. Donnelly and Hogan (2012) introduced the Critical Junctures Theory from Sweden and Ireland; such theory was used in recent history to make significant policy changes. Sabatier & Weible (2014) also used the Punctuated Equilibrium Theory to resolve political differences.

The problem of property damage resulting from induced earthquakes by HF was underreported in the existing literature. Shale gas projects had a negative impact on private property, and the directors of such projects were preoccupied with corporate objectives. It was rather clear that HF caused damage to the environment as well as private property. While shale gas projects provided great economic revenue, the end did not quite justify the means in some cases. Perhaps some adjustments could be made to improve safety and save lives. Corporate America prospered from HF projects; however, scholarly reviews of the destructive effects of induced earthquakes by HF were lagging. This situation could be improved by reassessing the political process and calling for coordination between lawmakers and community leaders, so that good projects do not fray around the edges. Another possible way to avoid political fallout from these projects is to enhance the idea and vision of collaborative governance.

Property damage due to earthquakes tremors was evident. Shale gas operations produced substantial revenue for state agencies. Therefore, state governments are not expected to drastically change their policies regarding the rules of hydraulic fracturing. Traditionally, governments never controlled themselves especially in situations where the element of control was bound to reduce their revenue. The public should realize these simple facts and act accordingly. Some scholars addressed the role of interest groups lobbying in advance of rulemaking sessions to influence the outcome of policy, so the notion that state governments would drastically change their HF policies to appease the public was not realistic. The public should continue however, to document their concerns and appeal the negative aspects of HF at the stakeholders' meetings.

Chapter 3: Research Methodology

Introduction

The purpose of this study was to correlate individual characteristics with awareness about the catastrophic impact of earthquakes. The proposed quantitative method was non-experimental, and the analysis of collected data yielded some interesting correlations among the introduced variables.

Research Design and Rationale

The design is non-experimental correlation- comparative regression model. The cross-sectional sampling method was selected because it was likely to produce a diverse audience. The methodology incorporated all elements of research to ensure alignment and cohesiveness of the construct (the researcher traced his steps several times over in writing the dissertation). The provinces that have been active with earthquakes are The South-Central Oklahoma Oil Province [SCOOP] and Sooner Trend Anadarko Canadian Kingfisher [STACK]; these provinces suffered recurring earthquakes (figure 8). However, the recruitment was administered by SurveyMonkey from the entire US population.

Provinces Active with Earthquakes.

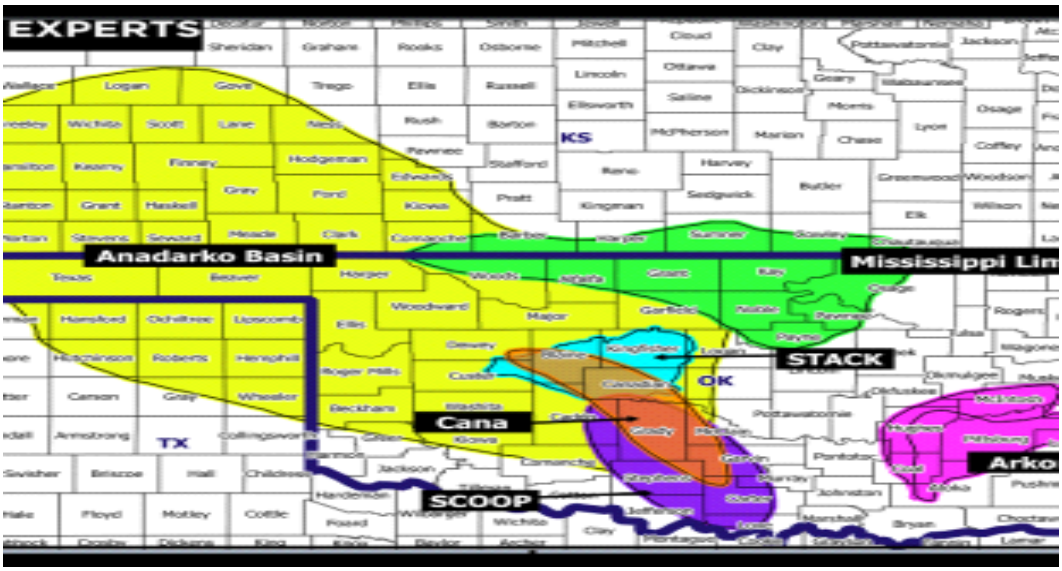


Figure 8. Courtesy: U. S. Geological Survey.

The dependent variable [DV] represented the extent of individual awareness about earthquakes, and the independent variables [IV] represented 9 personal characteristics:

Age

Gender

Education

Income

Professional Leadership

Marital Status

Interest in politics

Outdoor Camping Experiences

Real-Estate holdings

There were no research studies that the researcher was aware of that tested awareness of earthquakes relative to personal characteristics.

Spearman Correlation was used in this research because it suited the binary variables better than Pearson correlation methods did. A regression analysis followed this research because regression studies often compliment and complete correlation studies. A test score of (+1) meant that a maximum positive correlation between the dependent and independent variable existed. A test score of (-1) meant that a maximum negative correlation between the dependent and independent variable also existed. A test score of (0) meant that no correlations between the variables existed.

Research Question

The research question is:

What possible correlations are there between personal characteristics and awareness about earthquakes?

Hypotheses

H_0 (Null): $\rho = 0$ (there is no correlation between the dependent variable and the independent variables.

H_1 (Research): $\rho \neq 0$ (there is a correlation between the dependent variable and the independent variables).

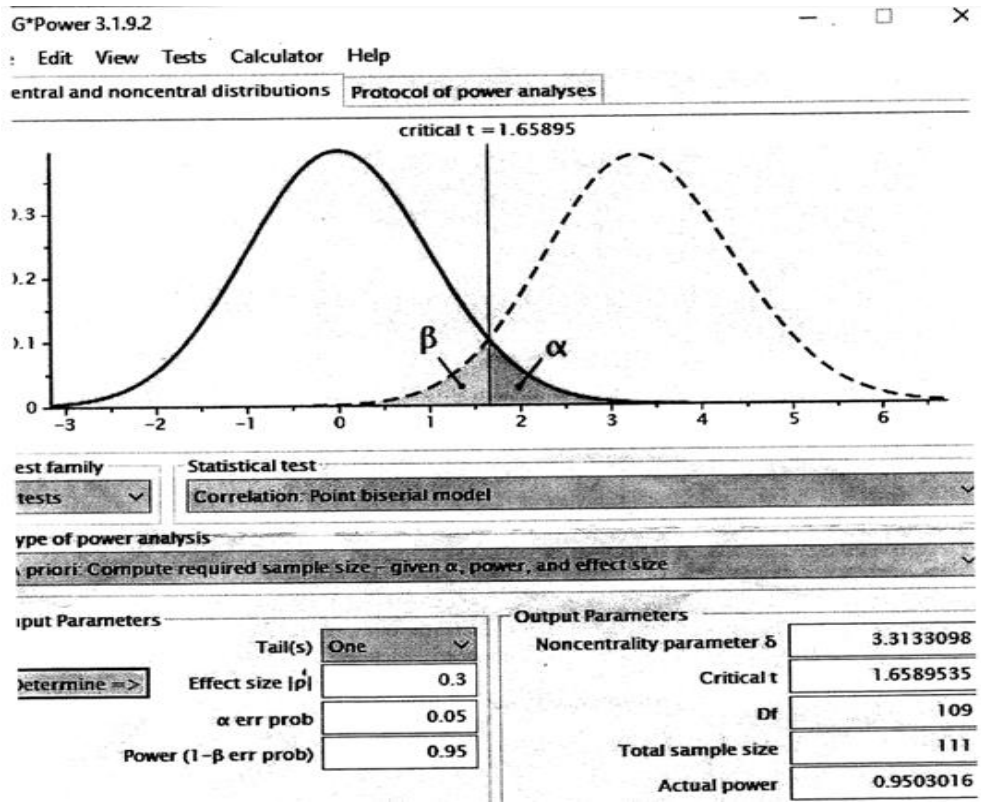
Methodology

Population

The target population is the entire population from which the samples are drawn. Specifically, it is the entire US population for this research. The United States population is 328.2 million US citizens (Census & Demographics, 2019).

Sample Size

Sample size was computed by the G*power software to be 111 participants (Appendix C). Keeping in mind that [Correlation = ρ; Effect Size = ρ^2] => [Effect size = 0.3, α = 0.05, β = 0.05 => statistical power = 0.95] (Faul, Erdfelder, Buchner, Lang, 2009). The concept of statistical power (1-β) was based on the given values of effect size [ρ'], and the error probability for both of [α] and [β]. Note that the effect size ρ' was different from the correlation symbol ρ introduced in the hypotheses. The assigned values [ρ' = 0.3, α = 0.05, β = 0.05 => 1-β = 0.95] are interrelated components of one formula. According to this statistical instrument [G*power software 3.1.9.2], effect size conventions reveal that the best effect size value is the median value of 0.3. If this value is to be increased to 0.4, the total sample size would only be 59, so there are considerable variations in terms of sample size especially when negligible values are added or subtracted from the medium effect size value.



Graph 1. Sample Size.

Sample bias was not existent since the scope and boundary of the study were open to all 50 states plus the District of Columbia; this implied that there was no limitation to transferability and that sample size had no negative impact on external validity.

Sampling Procedures

Data were collected by cross-sectional sampling methods. Sampling was drawn from 50 of the United States plus the District of Columbia. SurveyMonkey was used because it had a wide audience base. The researcher and SurveyMonkey set the parameter of the study to ensure the inclusion of all segments of the population into the sample. The researcher's method for reaching participants was open for adjustments to ensure that a

minimum of 111 subjects had participated in the study. The Consent Form was included in the anonymous survey.

Sample Characteristics

The sample maybe drawn from multiple districts identified by earned income brackets to ensure that all income brackets are factored into the sample. The sample was filtered by responses to two screener questions. Subjects were asked whether they consent to be in the study; those that answered "No" were dropped from the data. Potential subjects were also asked whether they were in a protected group such as the emotionally or mentally disabled group; those that answer "Yes" were also dropped from the data.

Data Collection

Data were collected from participants' responses to the Anonymous Survey. The independent variables in the survey were Age, gender, education, income, professional leadership, marital status, outdoor camping experience, political interest, and Real-Estate holdings. The dependent variable was individual awareness. The confidentiality of participants' answers to the survey were respected and stored in the researcher's password-protected computer. There were no follow-up interviews with participants because the collected data from the anonymous survey were sufficient for data analysis.

Dataset

The dataset produced by SurveyMonkey was analyzed by the SPSS analytical instrument. After collecting the data, the dataset file (*The Plight of Earthquake*

Victims.sav) was exported to the SPSS software to complete its analysis and look for possible correlations between each set of two variables.

Scoring of the Dependent Variable

The researcher provided the professional courtesy of notifying the author of the Likert instrument, Dr. Vagias, of his desire to use the Likert scale; Dr. Vagias approved to use the instrument in this study (p. 104). Dr. Vagias' approval was made available to the Committee chair, Dr. Bagwell. The dependent variable was gauged by the Likert scale instrument on a scale consisting of five scoring points to the survey question. The collected answers to the survey question were stated below.

Survey Question:

When you recall a significant earthquake experience, how concerned do you get about the catastrophic impact of earthquakes on the population?

Table 1

Dependent Variable of the Study

Level of Awareness	Scoring points	SPSS Score	SPSS Code
Not at all concerned	1	1	xyz_1
Slightly concerned	2	2	
Somewhat concerned	3	3	
Moderately concerned	4	4	
Extremely concerned	5	5	

Note: From "Likert-type scale response anchors" by Vagias, Wade M., 2006, at Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. This scale was used with permission.

Variable Types

Variables were divided into two categorical and continuous groups for the purpose of manual fitting of the data into the SPSS analytical instrument. Categorical variables are useful in studies aimed at identifying the dichotomy of one variable [high or low, yes or no, male or female], whereas the continuous variables are useful in identifying a trend in the data over time.

Table 4

Variable Types

Variable type	DV	IV	Variable Type	Variable Sub Type
Awareness	X		Continuous	Ratio
Age		X	Continuous	Ratio
Gender		X	Categorical	Binary
College Education		X	Categorical	Binary
Income		X	Continuous	Ratio
Professional Leadership		X	Categorical	Binary
Marital Status		X	Categorical	Binary
Outdoor Camping Experiences		X	Categorical	Binary
Real-Estate Holdings		X	Categorical	Binary
Political Interest		X	Categorical	Binary

Variable types are useful in sorting out the categorical from the binary variables in the SPSS analytical tool. While categorical variables were divided into two groups and assigned values of (0) for yes and (1) for no; the continuous variables were measured by ratio.

Table 5

Independent Variable Scoring

Variable Scoring	Measure	Range	SPSS Code	SPSS Score
Age	years	18 - 85	age	Ratio #
Gender	Male, Female	N/A	gen	1 = M; 0 = F
College Education	Yes, No	N/A	coed	1 = N; 0 = Y
Income	Dollars	0 - 100000	incm	Ratio #
Professional Leadership	Yes; No	N/A	lead	1 = N; 0 = Y
Marital Status	Yes; No	N/A	mast	1 = N; 0 = Y
Camping Experiences	Yes; No	N/A	caex	1 = N; 0 = Y
Real-Estate Holdings	Yes; No	N/A	owpr	1 = N; 0 = Y
Political Interest	Yes; No	N/A	pi	1 = N; 0 = Y

Data Analysis

Collected data were computed in the SPSS software. The awareness variable was gauged by the Likert instrument on a scale consisting of 5 scoring points to a question as shown in Table 1. Based on collected data, possible correlation(s) or regression(s) could be identified from the variables.

Threats to Validity

The instruments used in this study measured what they were supposed to measure. The Likert scale which was published in 2006 proved to be applicable in this discipline, and the SPSS which was initially published in 1968 was also applicable in this discipline. Both instruments were used and applied in social sciences, and such aspect has increased the validity of the instruments and subsequently increased the validity of the study.

External Validity

The external validity of a study could be used for generalizing the findings of study over the entire population (O'Sullivan et al., 2008). Generalizing the results of this research would have been possible had it been funded to support the time-series model of collecting data. The procedures for sampling were supportive of the external validity of the study. The parameter was set to ascertain the inclusion of all segments of the population in the sample. The United States population is 328.2 million US citizens from which group the sample was drawn (Census & Demographics, 2018). The sample bias impact on the external validity was minimal since the scope and boundary of the study were open to all 50 states plus the District of Columbia; this meant that there was no limitation for the transferability of data and that the external validity of the study was acceptable.

Internal Validity

The internal validity can be enhanced as the researcher isolates one variable while controlling all other variables during the analysis (Frankfort-Nachmias & Nachmias, 2008). Sufficient control over the results of research couldn’t easily be reached because it

was not possible to account for all the independent variables that influenced awareness of earthquakes. Correlation-studies differed from causation-studies which focus on cause and effect. Causation studies dealt with spurious variables that affect both the independent and dependent variables (Frankfort-Nachmias & Nachmias, 2008), and to that end, the internal validity hinged to some extent on other hidden variables that perhaps weren't the subject of this correlation study.

Construct Validity

The narrative of this study was based on theory. The appropriateness of theory was found in its methodology of testing the introduced hypotheses. Theory could emerge from patterns of collected data (Creswell, 2009). This speculative model of possible correlations among variables was at the heart of this narrative. Threats to the theoretical construct could materialize when a conceptual approach refutes the premise of theory.

Ethical Procedures

The objective of this research was to enhance public health and safety. The Consent Form provided to the participants in the study was part of the ethical objective; it was to ensure participants' understanding of the purpose of research. Participants had the option to decline participation in the anonymous survey. Participants were not exposed to any risks addressed in the IRB Form since their responses were kept anonymous. Finally, participants were not compensated for their participation in the survey, and this aspect ensured that their responses to the survey were not motivated by compensation.

Summary

The quantitative inquiry was chosen for analysis of the variables that correlate with awareness, and the proposed hypotheses tested possible correlation(s) between the variables of interest. The cross-sectional design choice was fit for increasing the external validity of the study.

The theoretical approach was at the heart of this research study. Spearman Correlation was introduced in this research to formulate the hypotheses and provide an understanding of the proposed correlation-study. A strong correlation relationship between the variables of interest would have been an indication of high internal validity. The theoretical construct was reflected in the narrative of this study; David Easton's theory and the Critical Junctures Theory were chosen to guide the narrative of the study, and the Punctuated Equilibrium Theory was noted to justify public policy and resolved political differences.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to elevate awareness about earthquakes in Oklahoma. A quantitative inquiry was used to address possible correlations between individual characteristics such as age, gender, and income; and awareness about man-made earthquakes. The degree of statistical confidence in this research depended on the results of analysis. If the results did not indicate any significant correlations between the variables, then perhaps public awareness was dependent on variables other than the variables introduced in this study.

Research Questions

The research question stemmed from a priori problematic to public safety. The research question is:

What possible correlations are there between personal characteristics and awareness about earthquakes?

Data Collection

SurveyMonkey were used to collect participants' responses to the survey. The time frame it took to collect data via social media was accomplished in 3 weeks, and the response rate came at 128% as we collected data from 143 participants when the power analysis required only 111 participants. Data analysis allowed the researcher to draw inferences from collected data.

Independent Variable Scoring Summary

Variable scoring was an expression for conceptualizing and identifying the variable in terms of SPSS scores. While categorical variables were divided into two groups, and assigned values of (0) for yes and (1) for no; the continuous variables were measured by a ratio. This was how the variables were measured in the SPSS instrument.

Table 5

Variable Scoring

Variable Scoring	Measure	Range	SPSS code	SPSS score
Age	years	18 - 85	age	Ratio #
Gender	Male, Female	N/A	gen	1 = M; 0 = F
College Education	Yes, No	N/A	coed	1 = N; 0 = Y
Income	Dollars	0 - 100000	incm	Ratio #
Professional Leadership	Yes; No	N/A	lead	1 = N; 0 = Y
Marital Status	Yes; No	N/A	mast	1 = N; 0 = Y
Camping Experiences	Yes; No	N/A	caex	1 = N; 0 = Y
Real-Estate Holdings	Yes; No	N/A	owpr	1 = N; 0 = Y
Political Interest	Yes; No	N/A	pi	1 = N; 0 = Y

Techniques for Data Collection

The Survey Research established by the researcher was coupled with the IRB guidelines to collect data. The independent variables in the survey were Age, gender, education, income, leadership attribute, marital status, outdoor camping experience,

political interest, and Real-Estate holdings. The dependent variable was individual awareness. The confidentiality of participants' answers to the survey were respected and stored in the researcher's password-protected computer. There were no follow-up interviews with participants because the collected data from the anonymous survey were sufficient for data analysis.

Study Results

The dataset produced by SurveyMonkey was analyzed by the SPSS analytical instrument. After collecting the data, the dataset file (*The Plight of Earthquake Victims.sav*) was exported to the SPSS software to complete its analysis and look for possible correlations between each set of two variables.

A sample of 143 respondents had recorded the collected data for this study. The sample of 143 respondents have met the requirements and completed the survey. The summary statistics for respondent demographics and backgrounds is presented in Table 6.

Table 6.
Frequency Table

		N	count	percent
Age	18-29	143	35	24.5
	30-44	143	28	19.6
	45-60	143	57	39.9
	> 60	143	23	16.1
Gender	Male	143	59	41.3
	Female	143	84	58.7

	$0-$9,999	143	7	4.9
	$10,000-$24,999	143	20	14
	$25,000-$49,999	143	34	23.8
	$50,000-$74,999	143	25	17.5
Household	$75,000-$99,999	143	16	11.2
Income	$100,000-$124,999	143	14	9.8
	$125,000-$149,999	143	8	5.6
	$175,000-$199,999	143	1	0.7
	$200,000+	143	10	7
	Prefer not to answer	143	8	5.6
Politics	Yes	143	83	58
	No	143	60	42
	Yes	143	116	81.1
College	No	143	27	18.9
	Yes	143	54	37.8
Leadership	No	143	89	62.2
	Yes	143	81	56.6
Married	No	143	62	43.4
	Yes	143	68	47.6
Real Estate	No	143	75	52.4
	Yes	143	38	26.6
Camping	No	143	105	73.4

Subjects were also asked “When you recall a significant earthquake event, how concerned do you get about the catastrophic impact of earthquakes?” to which they could respond on a five-point scale from “Not at all concerned” to “Extremely concerned”. This had a mean response of (3.175) with a standard deviation of (1.171). The distribution of responses is displayed in Figure nine.

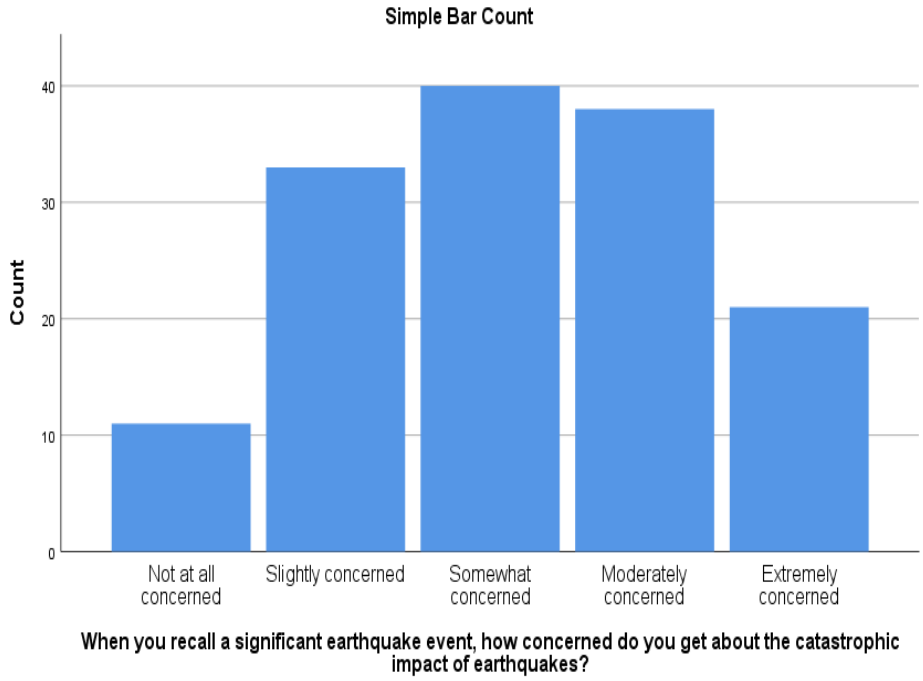


Figure 9. The Measure of Concern about Earthquakes.

Correlations

Spearman rho correlations were calculated between the concern about earthquakes variable and all other variables (Table 7). There was a significant correlation only between household income and awareness about earthquakes ($r = -0.185$, $p = 0.027$). Thus, there was an inverse relationship between awareness about earthquakes and household income.

Table 7

Spearman Correlations	rho correlation coefficient	Sig. (2-tailed)
Gender	-0.051	0.547
Politics	-0.061	0.471
Age	0.049	0.558
Household Income	- 0.185*	0.027
College	0.115	0.172
Leadership	0.162	0.054
Married	0.047	0.577
Real Estate	0.129	0.124
Camping	0.006	0.944

Correlation is significant at the 0.05 value (2-tailed).

Regression

The regression model results were illustrated in Table 8 which showed that none of the variables in the model were significant.

Table 8

Regression Model

	B	std. error	t	sig.	lower bound	upper bound
(Constant)	2.735	0.386	7.093	0	1.972	3.497
Gender	-0.01	0.209	-0.046	0.964	-0.423	0.404
Age	0.065	0.065	1	0.319	-0.064	0.194
College	0.222	0.256	0.867	0.388	-0.285	0.729
Leadership	0.281	0.214	1.314	0.191	-0.142	0.704
Real Estate	0.248	0.208	1.191	0.236	-0.164	0.66
Household Income	-0.028	0.037	-0.748	0.456	-0.102	0.046

Note. R-squared = 0.062 and the adjusted R-squared was 0.018.

Summary

The alignment of the different components of the research required careful planning. The alignment of the research question with statistical analyses to support the purpose of research can sometimes strengthen the study in one direction only to weaken it in another. Although the model was empirically tested, the results of the SPSS analysis did not indicate many significant variables correlating with public awareness. The researcher remained honest not to manipulate the data or create any illusions about it in order to satisfy certain biases associated with the problem. The interpretation of the results is yet to be reported in chapter five.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this research was to create a dynamic where policymaking responds to public consensus. The quantitative nature of this research was adopted to produce an empirical study that differed from the existing literature that casually linked earthquakes to fossil-fuel operations. The purpose of this chapter is to square the results of data analysis with the hypotheses. The SPSS analysis was used to confirm or nullify the established hypotheses.

Research Question and Hypotheses

The research question was as follows: What possible correlations are there between personal characteristics and awareness about earthquakes?

H_0 (Null): $\rho = 0$ (there is no correlation between the dependent variable and the independent variables.

H_1 (Research): $\rho \neq 0$ (there is a correlation between the dependent variable and the independent variables).

Interpretation of Findings

The results of the correlation test indicated one significant inverse correlation between income and participants' awareness of earthquakes. The dataset file was exported into SPSS. Prior to SPSS analysis, the data were filtered by responses to two screener questions: (a) Candidates were asked whether they consented to be in the study; those that answered "No" were dropped from the data; (b) Candidates were also asked

whether they were in a protected group; those that answered “Yes” were also dropped from the data for reasons related to the instructions provided by the IRB. This left 143 completed responses that were used in the analyses. Frequencies were reported for all binary and categorical variables, mean, and standard deviation for the ordinal outcome variable. Next, Spearman correlations were presented between the concern about earthquakes variable and all other variables. Spearman’s rho was reported rather than Pearson’s *r*, since the variables are mostly binary or ordinal (with the exception of age, income, and awareness). Finally, a linear regression model was fit with concern about earthquakes as the outcome variable and the following predictors; gender, age, college education, household income, professional leadership, political interest, outdoor camping experience, and real estate holdings.

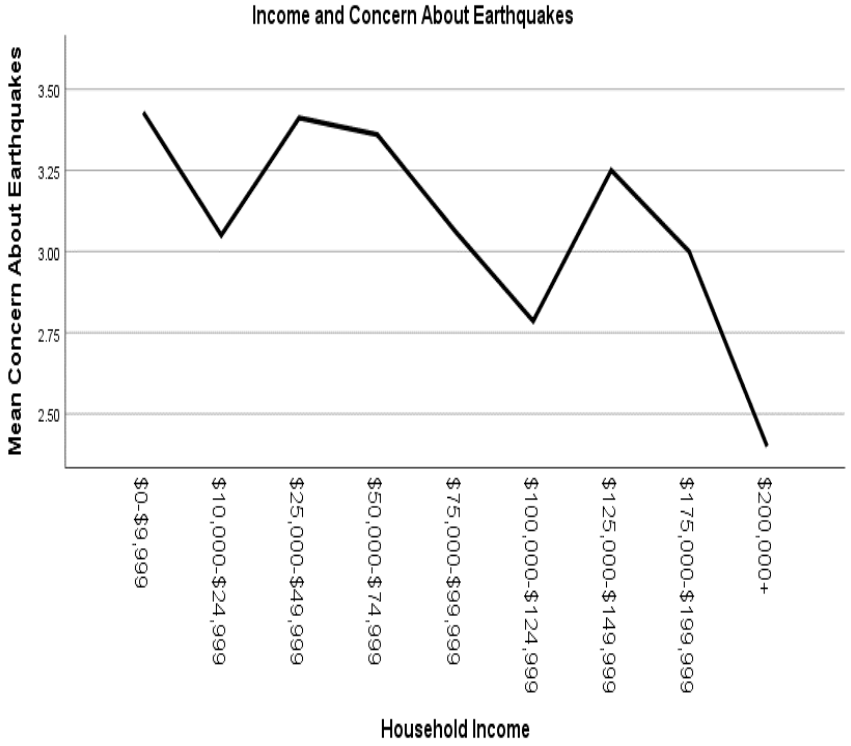


Figure 10. Regression Analysis of Income vs. Awareness about Earthquakes

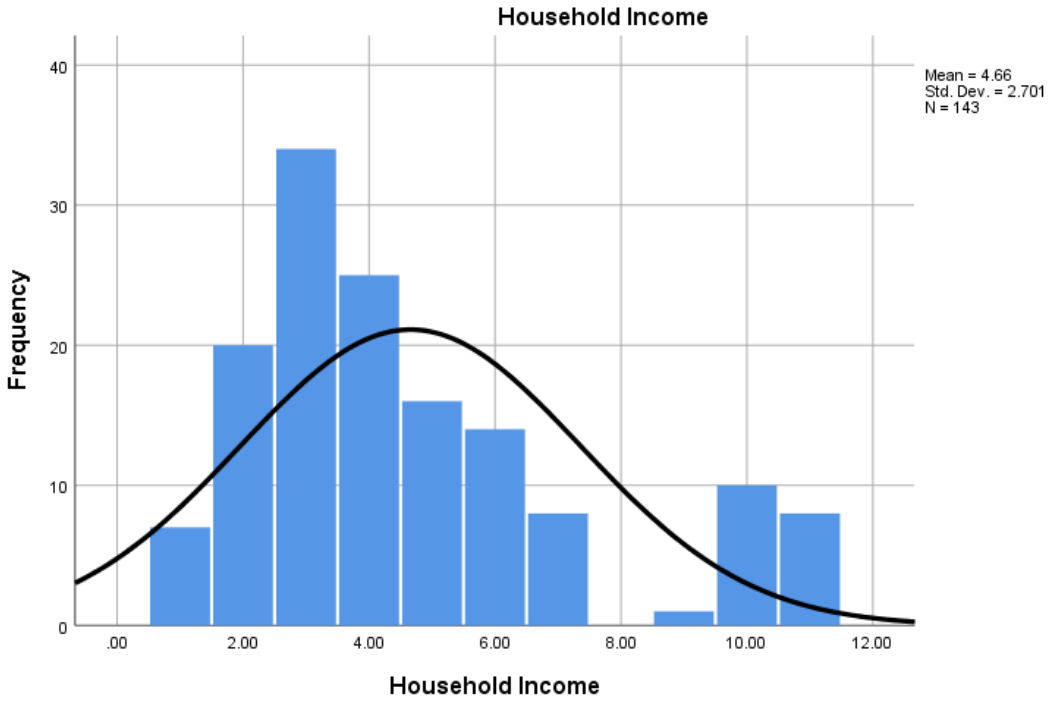


Figure 11. Bar chart representing income vs. Awareness of Earthquakes

Results

The sample of 143 respondents met the requirements and completed the survey. The summary statistics for respondent demographics and backgrounds was presented in Table 6. There were 35 (24.5% of non-missing responses) who were 18-29, 28 (19.6%) in the 30 to 44 range, 57 (39.9%) in the 45 to 60 range, and 23 (16.1%) who were 60 and over. There were 59 (41.3%) males and 84 (58.7%) females in the sample. Of the respondents, only 7 (4.9%) of the respondents reported their household income in the $0-$9,999 range, 20 (14%) were in the $10,000-$24,999 range, and 34 (23.8%) were in the $25,000-$49,999 range. Additionally, 25 (17.5%) were in the $50,000-$74,999 range, 16

(1.2%) were in the $75,000-$99, 9999 range, 14 (9.8%) were in the $100,000-$124,999 range, 8 (5.6%) were in the $125,000-$149,999 range, 1 (0.7%) was in the $175,000-$199,999 range, and 10 (7%) were over $200,000. An additional 8 (5.6%) preferred not to answer; these were dropped for the remainder of the analyses. Of the respondents, 83 (58%) were interested in politics and 60 (42%) were not. When asked whether they had attended college, 116 (81.1%) responded yes and 27 (18.9%) responded no. To determine leadership attributes, respondents were asked whether they hold a leadership role at their current position; 54 (37.8%) responded yes and 89 (62.2%) responded no. Of the respondents, 81 (56.5%) were married, and 62 (43.4%) were not. Next, subjects were asked whether they owned real estate; 68 (47.6%) said yes and 75 (52.4%) said no. Finally, respondents were asked whether they had recently been camping; 38 (26.6%) said yes and 105 (73.4%) said no.

Spearman rho correlations were calculated between the concern for earthquakes variable and all other variables, table seven. There was one significant correlation between household income and awareness of earthquakes (rho = - 0.185, p = 0.027). Thus, there was an inverse relationship between awareness of earthquakes and household income, that is, as income increased, concern decreased. Since the correlation was under 0.20, this implied a small effect size. Additionally, the regression model was fitted using awareness of earthquake as the outcome and the following predictors: Gender, age, college education, Professional leadership, real estate holdings, and household income. Table 8 showed that two of the variables in the model were insignificant; R-squared is a measure of how well the data fits the model; values close to 1 indicate that the model is a

good fit, while values close to zero indicate that it is a poor fit. Finally, R-squared measures the proportion of variation in the dependent variable, and the adjusted R-squared measures the proportion of variation in the significant independent variables; the more non-significant independent variables in the model, the larger the value between the adjusted R-squared and R-squared.

Limitations of the Study

The limitations of the study are realized in the fact that most of the independent variables were binary except for age and income. The binary variables limited participants' data in terms of finding more correlations and solving the problem. Additionally, the narrative of the study was focused more on the SPSS analysis and less on subjective arguments. It did not address in depth the behaviors and attitudes of participants as it was normally the case in qualitative methods of inquiry.

Recommendations

Quantitative methods of inquiry that call for policy adjustments were rare. Because the qualitative methods of inquiry were prevalent relative to fossil fuel projects, further studies that use the mixed-methods approach are recommended to achieve results that are supported by scholarly arguments. This recommendation was not to imply that the quantitative methods of inquiry were unreliable; it was rather to combine the use of nominal data with other scientific perspectives on the subject. Further, the qualitative part of the mixed-methods approach is likely to help the researcher minimize possible threats to the reliability and validity of the study.

Implications for Social Change

The empirical research is a reliable tool that can serve the public and create positive social change in society. The findings of empirical research can be provided to policymakers to adjust their policies in consideration of public safety.

Conclusion

The SPSS analysis was conducted based on *The Plight of Earthquake Victims.sav* file provided by SurveyMonkey. The literature was mainly focused on the political context of well-drilling. Different authors who wrote about exploration drilling and induced earthquakes did not sufficiently address the issue of public awareness of earthquakes, nor did they adopt theory to solve political conflicts regarding drilling-policies. It was important to draw a distinction between the existing literature and this study which had a narrative based on Easton's Framework for Policy Analysis (1965); such narrative also justified making policy adjustments based on the premise of the Critical Junctures Theory.

Oklahoma is in the midst of a technological age, and technology made it possible to reach extraordinary sources of energy that was out of reach before. It would take prudent leadership to ensure that our new technological means do not become threat to public safety. Further, this research was relevant to public safety and health. The researcher's commitment to call for better rules regarding fossil fuels operations was in line with public health and safety. This study also brought attention into the high number of induced earthquakes by exploration drilling. Finally, the instruments used in this study measured what they were supposed to measure. The Likert scale which was published in 2006 proved to be applicable in this discipline, and the SPSS which was initially

published in 1968 was also applicable in this discipline. Both instruments were used and applied in social sciences, and such aspect has increased the validity of the instruments and subsequently increased the validity of the study.

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Appendix A

Table 1

Dependent Variable of the Study

Level of Awareness	Scoring points	SPSS Score	SPSS Code
Not at all concerned	1	1	xyz_1
Slightly concerned	2	2	
Somewhat concerned	3	3	
Moderately concerned	4	4	
Extremely concerned	5	5	

Note: From "Likert-type scale response anchors" by Vagias, Wade M., 2006, at Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. This scale was used with permission. (P. 10, 44)

Table 2

Congressional Leadership Fund (Center for Responsive Politics, 2016).

Donor	Name of Company	Date	Amount
Oberndorf, William, E.	Oberndorf Enterprises LLC	08/10/16	$500, 000
San Francisco, CA 94118			
Devon Energy Production		08/11/16	$500, 000
CO LP			
Oklahoma City, OK 73102			
Russell, Thomas, H.	Retired	09/02/16	$500, 000

Tulsa, OK 74136

(P. 30)

Table 3

Senate Leadership Fund (Center for Responsive Politics, 2016).

Donor	Name of Company	Date	Amount
Chevron		09/28/15	$1000, 000
Concord, CA 94524			
Petrodome Energy		10/09/15	$1000, 000
Houston, TX 77006			
Access Industries Inc		12/08/15	$1000, 000
New York, NY 10019			
Stephens, Warren, A.	Stephens Inc.	03/31/16	$1000, 000
Little Rock, AR 72201			
Chevron		03/17/16	$1000, 000
Concord, CA 94524			
McNair, Robert, C. SR	Houston, Texans	05/19/16	$1000, 000
Houston, TX 77054			
McNair, Robert, C.	Houston, Texans	04/30/15	$1000, 000
Houston, TX 77054			

Devon Energy Production		09/28/15	$750, 000
Oklahoma City, OK 73102			
Asness, Cliff	AQR Capital	09/23/16	$600, 000
New York, NY 10017	Management		
Stephens, Warren, A.	Stephens Inc.	08/31/16	$500, 000
Little Rock, AR 72201			

(P. 30)

Table 4

Variable Types

Variable type	DV	IV	Variable Type	Variable Sub Type
Awareness	X		Continuous	Ratio
Age		X	Continuous	Ratio
Gender		X	Categorical	Binary
College Education		X	Categorical	Binary
Income		X	Continuous	Ratio
Professional Leadership		X	Categorical	Binary
Marital Status		X	Categorical	Binary
Outdoor Camping Experiences		X	Categorical	Binary
Real-Estate Holdings		X	Categorical	Binary
Political Interest		X	Categorical	Binary

(P. 45)

Table 5

Variable Scoring

Variable Scoring	Measure	Range	SPSS Code	SPSS Score
Age	years	18 - 85	age	Ratio #
Gender	Male, Female	N/A	gen	1 = M; 0 = F
College Education	Yes, No	N/A	coed	1 = N; 0 = Y
Income	Dollars	0 - 100000	incm	Ratio #
Professional Leadership	Yes; No	N/A	lead	1 = N; 0 = Y
Marital Status	Yes; No	N/A	mast	1 = N; 0 = Y
Camping Experiences	Yes; No	N/A	caex	1 = N; 0 = Y
Real-Estate Holdings	Yes; No	N/A	owpr	1 = N; 0 = Y
Political Interest	Yes; No	N/A	pi	1 = N; 0 = Y

(P. 46, 51)

Table 6 *(Page 52 in the text).*
Frequency Table

		N	Count	Percent
Age	18-29	143	35	24.5
	30-44	143	28	19.6
	45-60	143	57	39.9
	> 60	143	23	16.1
Gender	Male	143	59	41.3
	Female	143	84	58.7
Household	$0-$9,999	143	7	4.9

Income	$10,000-$24,999	143	20	14
	$25,000-$49,999	143	34	23.8
	$50,000-$74,999	143	25	17.5
	$75,000-$99,999	143	16	11.2
	$100,000-$124,999	143	14	9.8
	$125,000-$149,999	143	8	5.6
	$175,000-$199,999	143	1	0.7
	$200,000+	143	10	7
	Prefer not to answer	143	8	5.6
Politics	Yes	143	83	58
	No	143	60	42
College	Yes	143	116	81.1
	No	143	27	18.9
Leadership	Yes	143	54	37.8
	No	143	89	62.2
Married	Yes	143	81	56.6
	No	143	62	43.4
Real Estate	Yes	143	68	47.6
	No	143	75	52.4
Camping	Yes	143	38	26.6
	No	143	105	73.4

Table 7. *(Page 55 in the text).*
Spearman Correlations

	Correlation Coefficient	Sig. (2-tailed)
Gender	-0.051	0.547
Politics	-0.061	0.471
Age	0.049	0.558
Household Income	-.185*	**0.027**
College	0.115	0.172
Leadership	0.162	0.054
Married	0.047	0.577
Real Estate	0.129	0.124
Camping	0.006	0.944

Note. * Correlation is significant at the 0.05 level (2-tailed).

Table 8. *(Page 56 in text).*
Regression Model

	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
(Constant)	2.735	0.386	7.093	0	1.972	3.497
Gender	-0.01	0.209	-0.046	0.964	-0.423	0.404
Age	0.065	0.065	1	0.319	-0.064	0.194
College	0.222	0.256	0.867	0.388	-0.285	0.729
Leadership	0.281	0.214	1.314	0.191	-0.142	0.704
Real Estate	0.248	0.208	1.191	0.236	-0.164	0.66
Income	-0.028	0.037	-0.748	0.456	-0.102	0.046

Note. R-squared = 0.062. Adjusted R-squared = 0.018 (adjusted for the number of predictors in the model; adjusted R-squared would add up the R-squared values from those variables whose addition in the model is significant).

Appendix B

Images may be subject to copyright even if the credit is given to the copyright owner.

Figure 1. BY PHIL MCKENNA. AUG 26, 2015.
Courtesy: Faces of Fracking, via Flickr (wastewater disposal from oil and gas drilling). (P. 3)

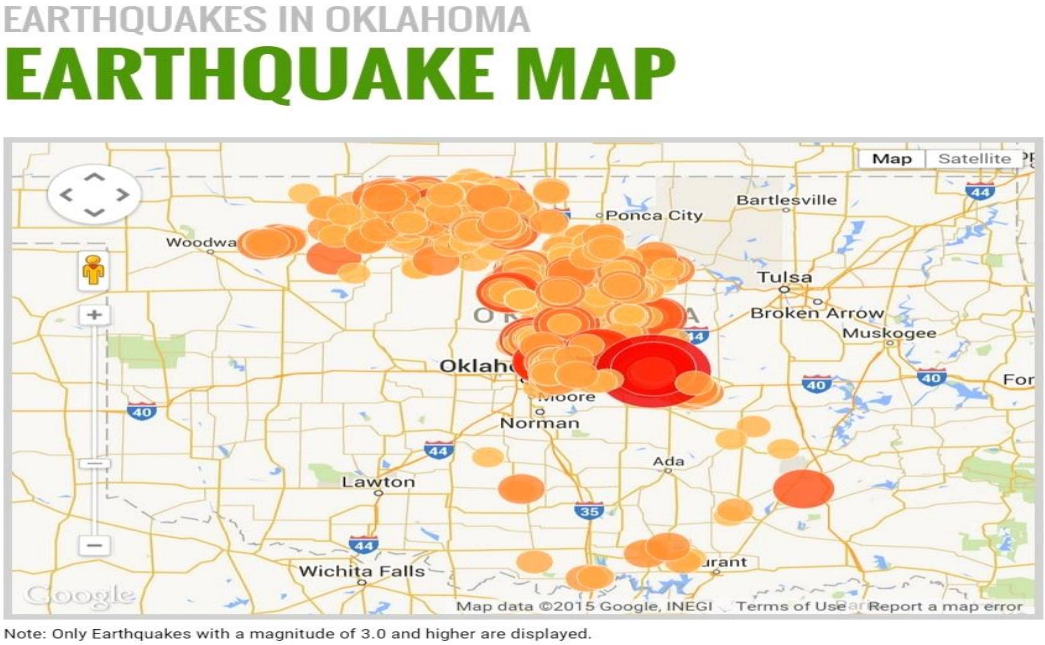


Figure 2. Courtesy: U. S. Geological Survey (P. 4)

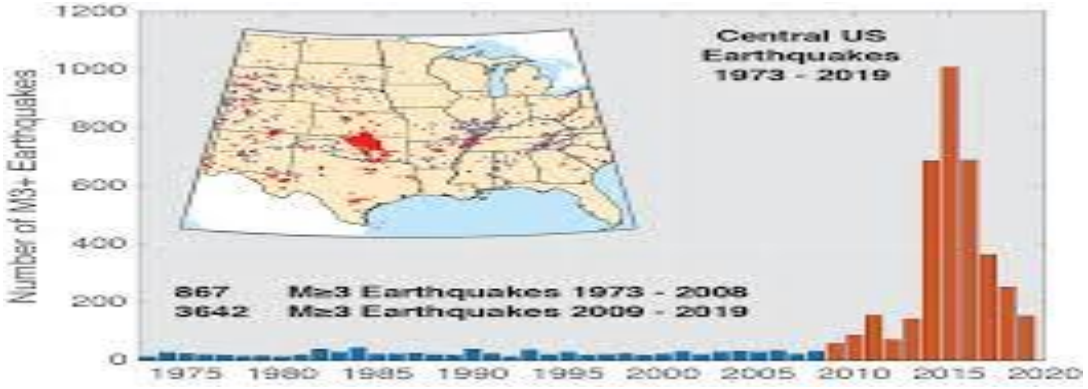
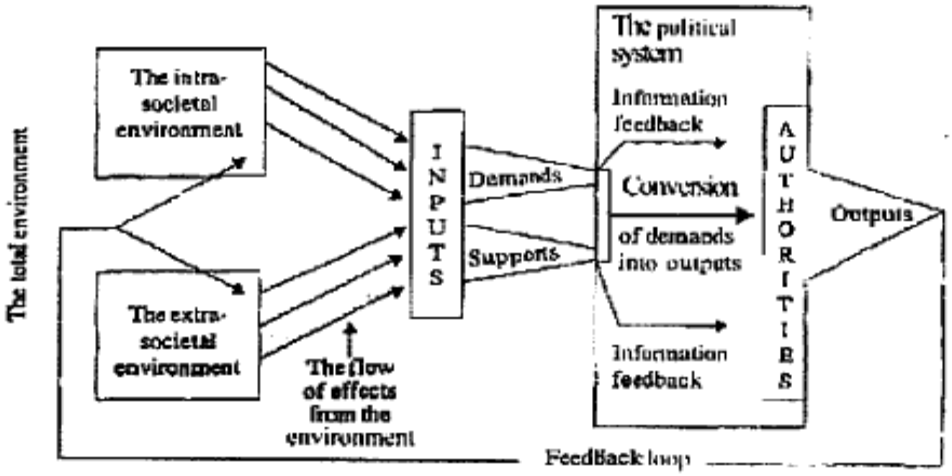


Figure 3. USGS Overview of Oklahoma earthquakes (p. 4)

Easton's Framework for Policy Analysis



Source: Adapted from Easton's A Framework for Policy Analysis (1965)

Figure 4. Courtesy: Adopted from Easton's A Framework for Policy Analysis (P. 6)

Critical Junctures Theory

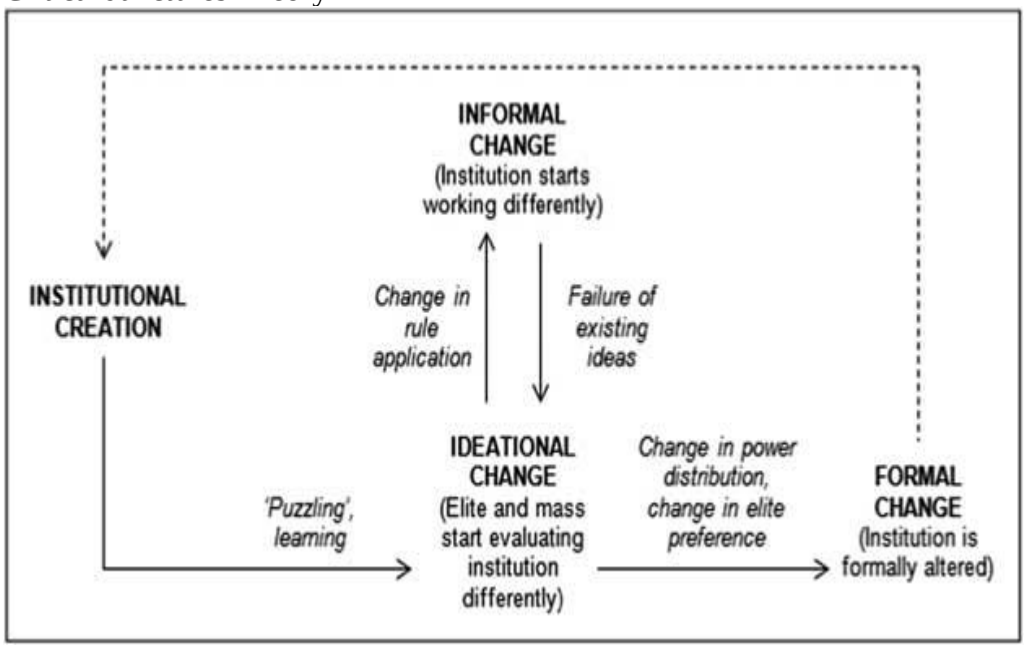


Figure 5. Courtesy: Cambridge University Press/Edward Anthony Koning. (P. 7)

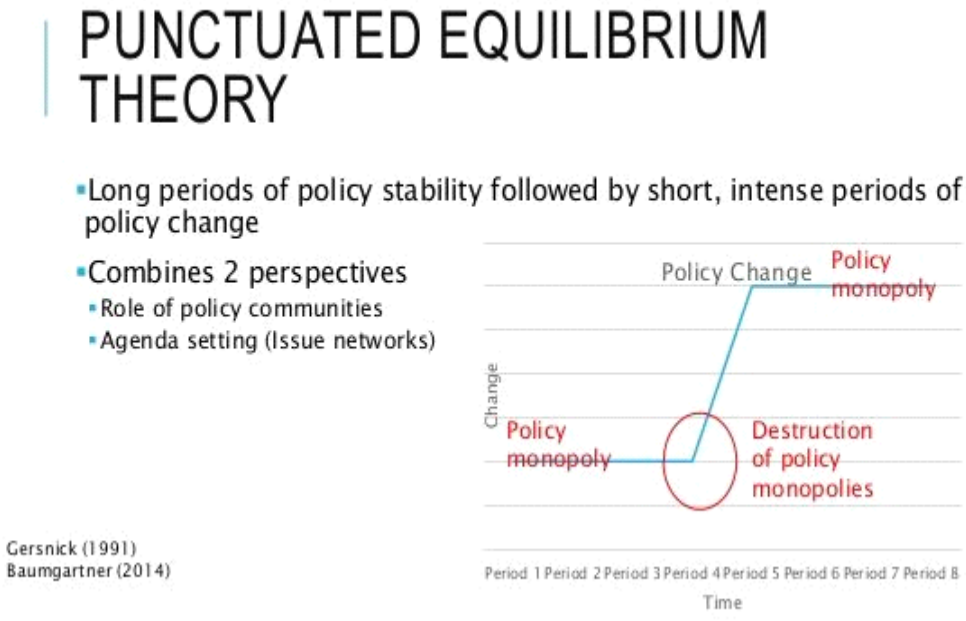


Figure 6. Courtesy: Gersnick. (P. 9)

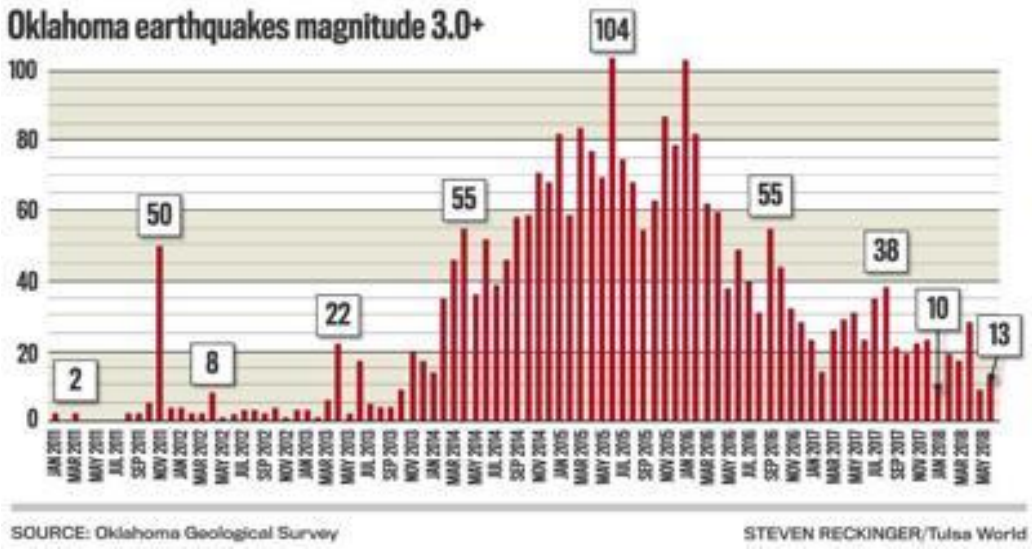


Figure 7. Oklahoma Earthquakes Magnitude (3.0+). Courtesy: Oklahoma Geological Survey. (P. 12)

Provinces Active with Earthquakes.

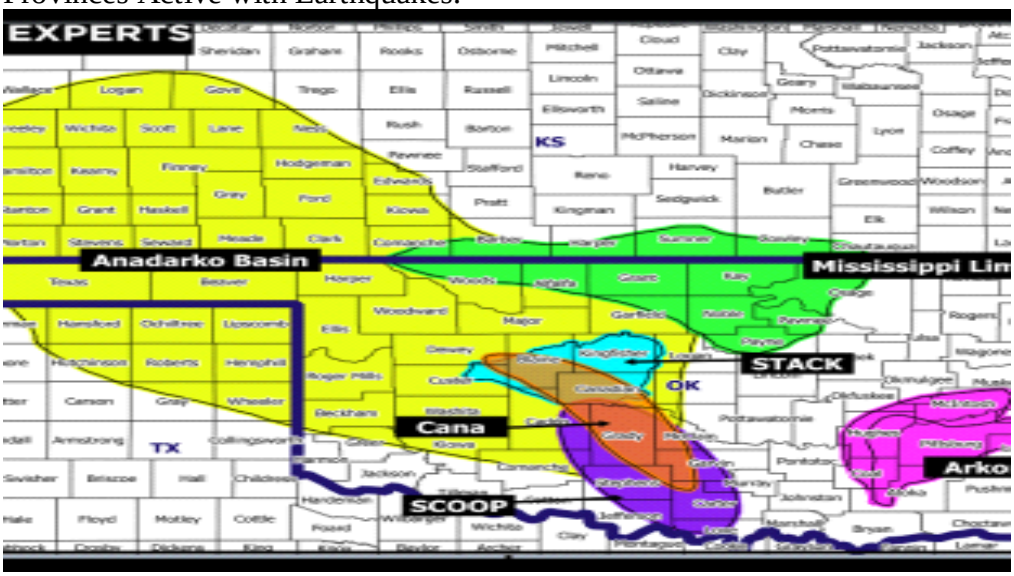


Figure 8. Courtesy: U. S. Geological Survey. (P. 39)

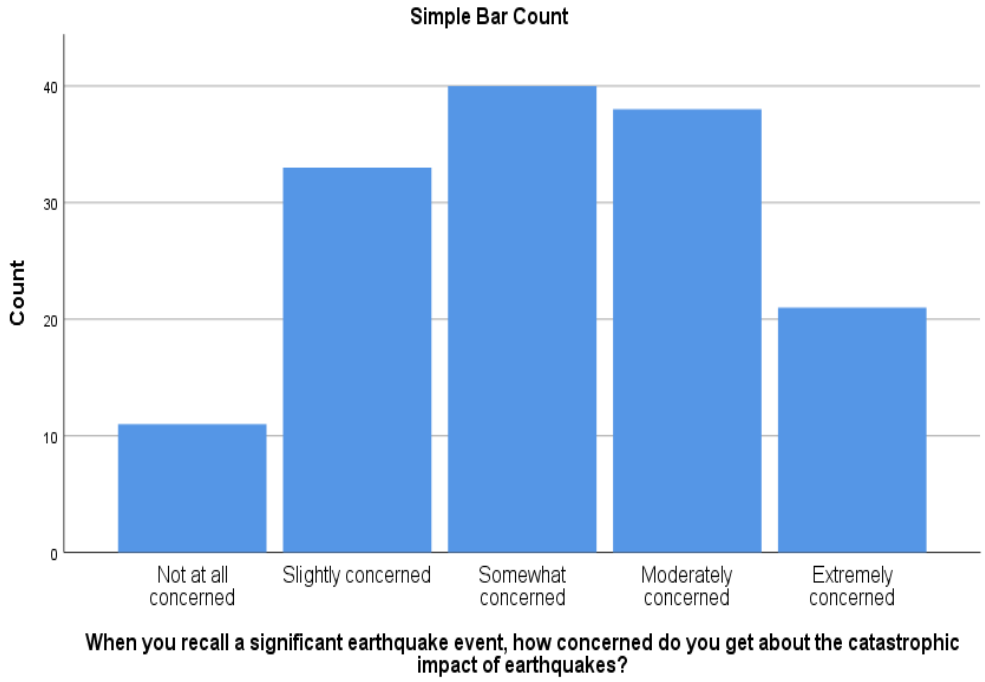


Figure 9. The Measure of Concern for Earthquakes. (P. 54)

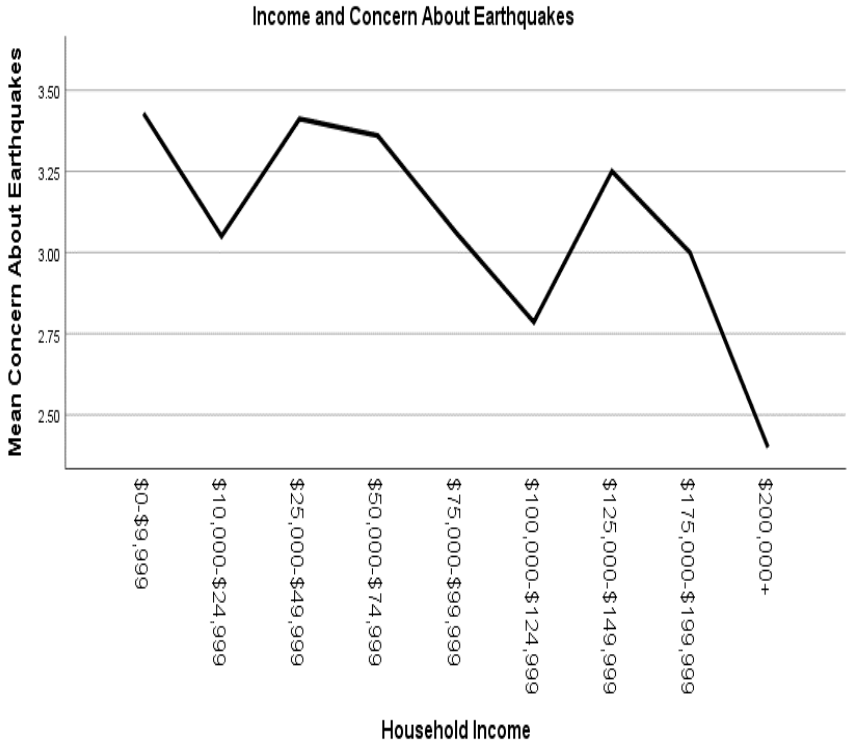


Figure 10. Regression Analysis of Income vs. Awareness for Earthquakes. (P. 59)

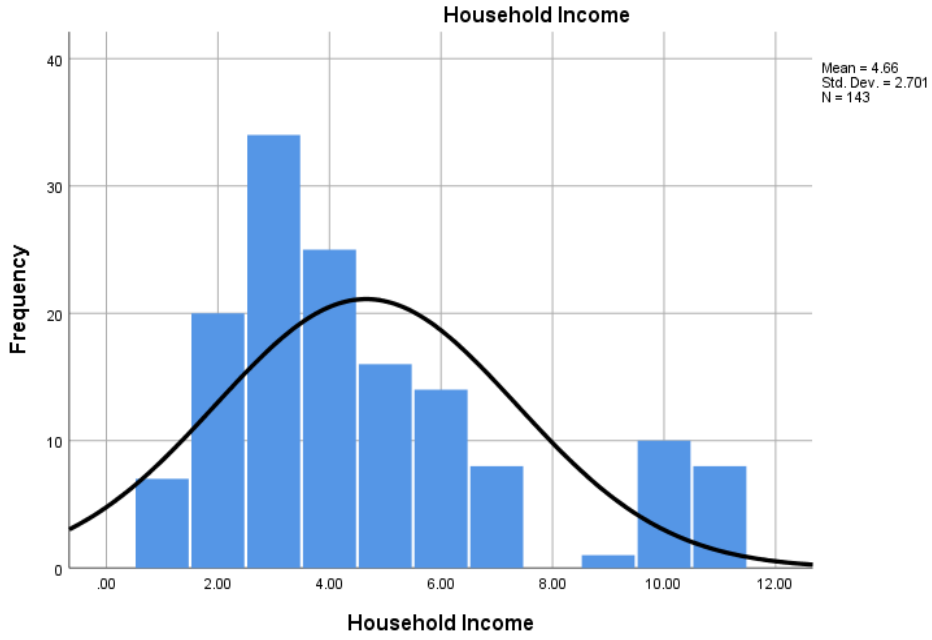
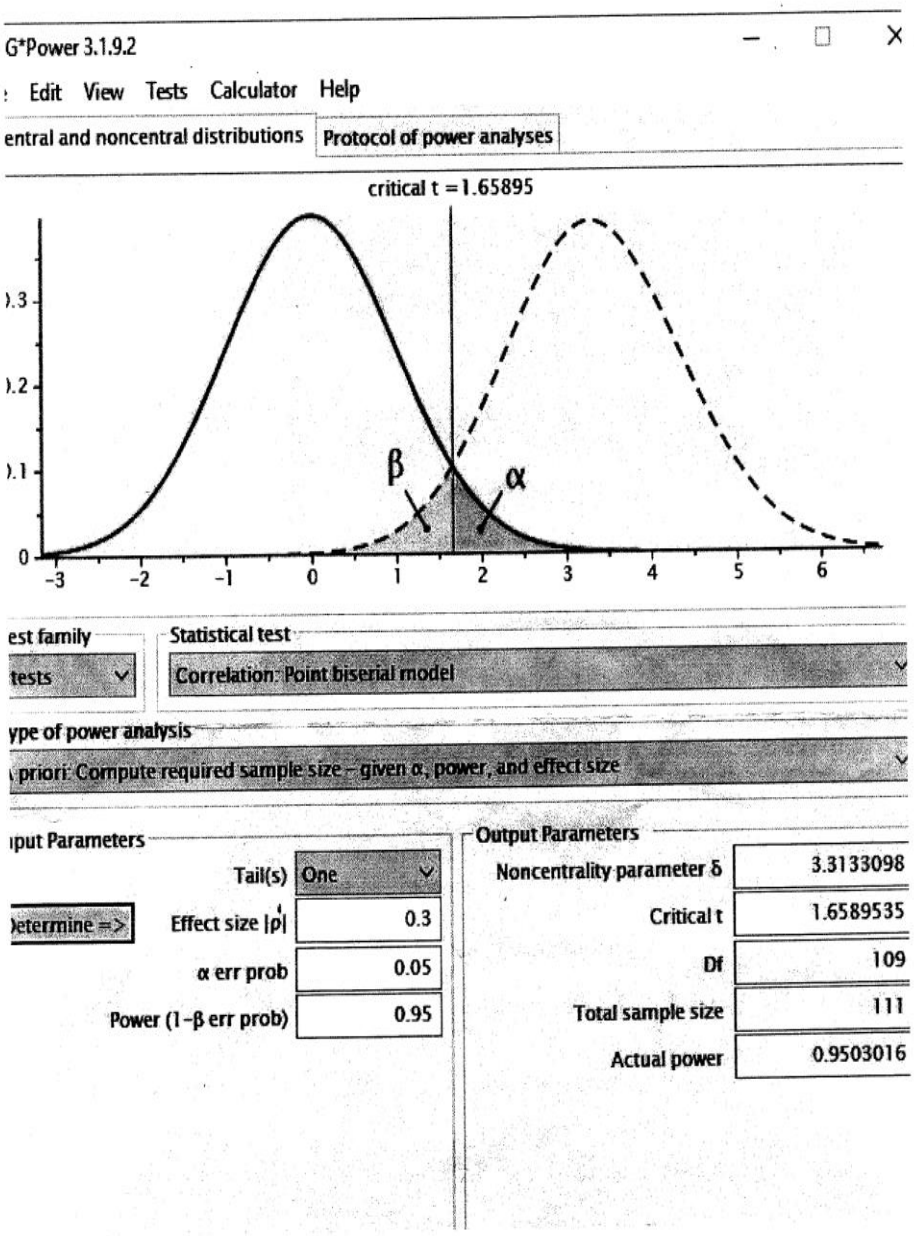


Figure 11. Bar chart representing income vs. Awareness of Earthquakes. (p. 59)

Appendix C



Graph 1. Sample Size, G Power of the study (P. 42)

Appendix D

Content of Syntax and Output File

```
* Encoding: UTF-8.

GET
  FILE='C:\Users\Documents\mike-allen-dissertation\data\The Plight of Earthquake
Victims.sav'.
DATASET NAME DataSet2 WINDOW=FRONT.


RECODE q0004 q0005 q0008 q0009 q0010 q0011 q0012 (1=0) (2=1).
EXECUTE.

VALUE LABELS
q0004
0 "Female"
1 "Male" /
q0005 q0008 q0009 q0010 q0011 q0012
0 "Yes"
1 "No" .


FILTER OFF.
USE ALL.
SELECT IF (q0001 = 1 & q0002 = 2).
EXECUTE.

FREQUENCIES VARIABLES=q0004 q0005 q0006 q0007 q0008 q0009 q0010 q0011
q0012  q0013 q0014 q0015
  /ORDER=ANALYSIS.

DESCRIPTIVES VARIABLES=q0003
  /STATISTICS=MEAN STDDEV MIN MAX.

* Chart Builder.
GGRAPH
  /GRAPHDATASET NAME="graphdataset" VARIABLES=q0003
COUNT()[name="COUNT"] MISSING=LISTWISE
    REPORTMISSING=NO
  /GRAPHSPEC SOURCE=INLINE.
```

```
BEGIN GPL
  SOURCE: s=userSource(id("graphdataset"))
  DATA: q0003=col(source(s), name("q0003"), unit.category())
  DATA: COUNT=col(source(s), name("COUNT"))
  GUIDE: axis(dim(1), label("When you recall a significant earthquake event, how
concerned do ",
    "you get about the catastrophic impact of earthquakes?"))
  GUIDE: axis(dim(2), label("Count"))
  GUIDE: text.title(label("Simple Bar Count"))
  SCALE: cat(dim(1), include("1.00", "2.00", "3.00", "4.00", "5.00"))
  SCALE: linear(dim(2), include(0))
  ELEMENT: interval(position(q0003*COUNT), shape.interior(shape.square))
END GPL.


NONPAR CORR
  /VARIABLES=q0003 q0004 q0005 q0006 q0007 q0008 q0009 q0010 q0011 q0012
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS  CI(95) R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT q0003
  /METHOD=ENTER q0004 q0006 q0008 q0009 q0011 q0015
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS HISTOGRAM(ZRESID)
  /SAVE ZRESID.

PPLOT
  /VARIABLES=ZRE_1
  /NOLOG
  /NOSTANDARDIZE
  /TYPE=Q-Q
  /FRACTION=BLOM
  /TIES=MEAN
  /DIST=NORMAL.
```

```
GET
  FILE='C:\Users\mike\Downloads\The Plight of Earthquake Victims.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
DESCRIPTIVES VARIABLES=q0003
```

```
  /STATISTICS=MEAN STDDEV MIN MAX SEMEAN.
```

Descriptives

```
[DataSet1] C:\Users\mike\Downloads\The Plight of Earthquake Victims.sav
```

Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
When you recall a significant earthquake event, how concerned do you get about the catastrophic impact of earthquakes (mark your answer with an X)?	143	1.00	5.00	3.1748	.09790	1.17074
Valid N (listwise)	143					

Research Survey

Please answer the following questions,

Variable	Measure
Age	Years (18-85)
Gender	M, F
College Education	Yes, No
Political interest	Yes, No
Income	Dollars (0-100000)
Leadership Status at work	Yes, No
Marital Status	Yes, No
Camping Experience	Yes, No
Real Estate Holdings	Yes, No

Question

When you recall a significant earthquake experience, how concerned do you get about the catastrophic impact of earthquakes?

Level of Awareness	Scoring points

Not at all concerned	1
Slightly concerned	2
Somewhat concerned	3
Moderately concerned	4
Extremely concerned	5

A Study of Public Awareness about the Threat of Earthquakes

CONSENT FORM

You are invited to take part in a research study about the number of earthquakes in Oklahoma. This form is part of a process called "informed consent" which allows you to participate or opt-out of the survey.

The researcher conducting this study is Mike Allen, who is a doctoral student at Walden University.

Background Information

The purpose of this study is to correlate personal characteristics with individual awareness about the impact of earthquakes on the population in Oklahoma.

Procedures

Participants in the survey will be answering 10 questions on the survey form. The survey is completely anonymous; it provides the researcher with data related to the participant's age, gender, and education; and measures the participant's awareness about the catastrophic impact of earthquakes on the population.

Survey Question

When you recall a significant earthquake event in Oklahoma, how concerned do you get about the catastrophic impact of earthquakes on the population?

Voluntary Nature of the Study

Participation is voluntary in the study. You are free to accept or decline the invitation. Participation in person is not required.

Risks and Benefits of Being in the Study

Minimal to no risk is expected since the survey is 100% anonymous. Additionally, Participants anonymous opinions have no bearing on their well-being or professions.

In terms of benefits of the survey, some participants may be impacted by Oklahoma earthquakes in their communities, this survey provided the opportunity to reflect on this problem.

Payment

No payment was made for participating in the study.

-Privacy

The anonymous responses are not used for any reason outside of this research project.

Contacts and Questions

You may ask any questions you have now. Or if you have questions later, you may contact the researcher via email at mike.allen@waldenu.edu. If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at the researcher's university at 612-312-1210. No participants from the researcher's family or from outside the US will contribute to this research. Walden University's approval number for this study is 10-01-19-0067544___ and it expires on __September 30th, 2020____

For anonymous paper-based research, this consent form was for record keeping.

Obtaining Your Consent

If you feel you understand the study well enough to make a decision about it, please indicate your consent by completing the survey. No consent signature is requested.

Survey Questions

Question Title

* 1. Do you consent to taking this survey?

Yes

No

NEW QUESTION

Powered by

SurveyMonkey

0 of 12 answered

COPY: The Plight of Earthquake Victims

Question Title

* 2. Do you belong in any of the following groups: Emotionally or mentally disabled, prison inmate or are you living in a treatment facility, nursing home, assisted living or group home for minors?

Yes

No

NEW PAGE

P3–Page Logic More Actions

LOGO

COPY: The Plight of Earthquake Victims

Question Title

* 3. When you recall a significant earthquake experience, how concerned do you get about the catastrophic impact of earthquakes (mark your answer with an X)?

Not at all concerned 1

Slightly concerned 2

Somewhat concerned 3

Moderately concerned 4

Extremely concerned 5

Question Title

* 4. Please indicate your gender (write M for Male, F for Female).

Female

Male

Question Title

* 5. Do you have interest in politics (mark your answer with an X)?

Yes

No

Question Title

* 6. How old are you (18-85)?

Question Title

* 7. Select one of the brackets for your annual earnings

Question Title

* 8. Have you attended college?

Yes

No

Question Title

* 9. Do you occupy a leadership position at work?

Yes

No

Question Title

* 10. Are you married?

Yes

No

Question Title

* 11. Do you own real estate?

Yes

No

Question Title

* 12. Have you had a recent outdoor camping experience?

Yes

No

Permission from Developer to Use the Likert Instrument

Likert-scale instrument.

Inbox

Mike Allen <aIIenmik6000@gmail.com> Jul 22, 2019, 2:20
to wade vagias

Hello Mr. Vagias,

I have learned about your research and identified this publication online: Vagias, W. M. (2()()6). Likert-type scale response anchors. Clemson International Institute for Tourism & Research [Development, Clemson University.

My research at Walden University is titled, The Plight of Earthquake Victims. In this research, I will be conducting a survey and asking (via electronic media) a question with 5 possible responses to it. The question is: When you recall a significant earthquake event in Oklahoma, how concerned do you get about the catastrophic impact of earthquakes?

The five possible answers to it are:

Not at all concerned
Slightly concerned
Somewhat concerned
Moderately concerned
Extremely concerned

I find this template rather appropriate to indicate the level of concern on the part of the participant. Walden University is asking me to ensure the legal use of this template; the faculties here apply this process across the board before the graduate can obtain approval from the Institutional Review Board (IRB) to proceed with the survey.

If you have developed the above template, do I have your permission to use it?

Your response to this email should be sufficient for the IRB.

Thank you

Mike Allen, MPA, PhD
Pending. (316) 226-6632

Vagias, Wade <wade_vagias@nps.gov> Jul 22, 2019, 2:24

to me

Mike: no problem, I just ask you cite your use of this document appropriately. Perhaps as follows (or using your university's approved format?):

Vagias, Wade M. (2006). Likert-type scale response anchors. Clemson International Institute

for Tourism & Research Development, Department of Parks, Recreation and Tourism

Management. Clemson University.

~*~*~*~*~*~*~*~*~*~*~*~*~

Wade M. Vagias, Phl) Superintendent
Craters of the Moon National Monument & Preserve
Hagerman Fossil Beds National Monument
Minidoka National Historic Site
(406) 581-1367

Mike Allen <alIenmik6000@gmail.com>

to Wade

Thank you very much!

Jul 22, 2019, 6:10

The Curriculum Vitae was not made a part of this document.